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CAMPING TIME

Many teachers are camping enthusiasts, and many others are at camps in the capacity of directors, or assistants, or as handicraft instructors. It is especially this latter class that will welcome the following references to articles that will interest the youthful camper. All of the articles referred to appeared in the 1935 and 1936 numbers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION: Summer-Camp Projects, 167, June, 1935; Snappy Log Cabin, 194, June, 1936; Canoe, 184, June, 1935; 14-Ft. Kayak, 31, January, 1936 (add 11 pieces of ¾" by ¾" by 16' S4S straight-grained spruce to the bill of material contained in this article); Marblehead-Class Sailing Sloop, 117, April, and 145, May, 1936; Sailing Kinks, 16, January, 1936; The Hardesty Special Monoplane, 213, July, 1935; Happy Landings Glider, 275, September, 1935; High and Low Hurdle, 345, September, 1935; Pack Frame, 196, June, 1935; Pack Rack, 340, November, 1935; Indian Peace Pipes, 310, October, 1935; Indian Tom-Tom, 382, December, 1935; Indian Bead Work, 95, March, 1936; Indian Gourd Rattles, 131, April, 1936; Making Rawhide, 96, March, 1936; Pushmobile Race, 12, January, 1936; Interesting Shuffle Puzzle, 223, July, 1935; Indian Moccasins, 194, June, 1936.

THIS MONTH'S COVER

The picture on the cover this month shows a log going up the chain ladder preparatory to being cut into boards. The mill shown is at the Sitgreaves National Forest, Arizona. Photo courtesy U. S. Forest Service.

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June, 1936
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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Practical Arts as Moral Education

Arthur B. Mays

Professor of Industrial Education,
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A fine outline of the possibilities also of the responsibility of the industrial-arts teachers to plan for the purposeful shaping of the moral conduct of their students.

The Arts in the Evolution of Culture

History, anthropology, and archaeology have much to say of the practical arts. They all speak of other things as well, but were it not for the arts of man and particularly his practical arts, there would be little any of them could say. It is in the remains of the useful objects early man created from natural materials all about him that anthropology is able to reconstruct the life he lived; and it is by the same means that archaeology reckons his age and dates the stages of his culture. History understands his behavior, and appreciates his limitations during any particular era by taking into account the state of development of his practical arts. And all three, by means of these arts, secure their facts and expound their knowledge. Through all the ages man's growth has been linked inextricably with his practical arts, and through his practice and improvement of them growth in culture has come to him. This relationship is so close in every age that to know the character of the useful things man has invented and created is to know the kind of man he is. Before history begins there is no other way to know man. In his *Prehistoric Times,* Sir John Lubbock said, "It is true that in the case of other animals we can, from their bones and teeth, form a definite idea of their habits and mode of life, while in the present state of our knowledge the skeleton of a savage could not always be distinguished from that of a philosopher. But, on the other hand, while other animals leave only teeth and bones behind them, the men of past ages are to be studied principally by their works: houses for the living, tombs for the dead, fortifications for defense, temples for worship, implements for use, and ornaments for decoration."* As man more effectively utilized the materials of nature for his own welfare and pleasure he gained in ingenuity, imagination, and contemplative ability. And, in turn, as he thus grew in culture he was the better able to create objects of use, beauty, and comfort. Thus a veritable cycle of progress seems to have been set in motion, and it moves today, as in all the past, with the same results.

Practical Arts in Modern Life

When modern life is studied, the same vital relationship is observed between the character of man's living and the advancement of his practical arts that has always obtained. Life today is very clearly determined in most of its external features by the present state of the useful things man has created. Modern civilization is what it is, very largely, because of the railroads, street cars, elevators, the radio, concrete, steel, and a thousand other significant results of the development of the practical arts. But, clearly, man cannot manage his way of living and thinking to conform to the marvelous things which impinge upon his consciousness at every turning and which determine the direction of his every movement, without his whole personality being shaped and colored by these same things. Man's spiritual culture, as well as his intellectual and physical culture, is inevitably conditioned in this age by the things he has made and with which he has surrounded himself. There are those who think that many of the more obvious and waxing ills of contemporary life are primarily the effects of what is often called the "moral lag" of life behind the conditioning material forces in operation; and that man has carried his practical arts to a point so far advanced beyond his moral ability wisely and constructively to appropriate their benefits, that they have become a menace like Frankenstein's monster. There is much to be said in support of this belief, but the only solution of the problem possible, is not to retard the progress of the practical arts, but rather to grow a morality that is in keeping with the controlling factors of civilized life. A major cause of man's failure to keep in step morally with his technological progress, has been his failure to understand fully the significance and the spiritual and social possibilities in the creations of his brain and hand. He has been too busy refining, admiring, and multiplying his creations to consider what they are doing to him, and to assume the obligations their existence imposes. It is here that organized education meets its great opportunity of this age; namely, to lead man to understand the social and spiritual significance of the work of his hands. Education can solve this problem, and in so doing it may save man from unintentional self-education.

The Practical-Arts Courses

To render such a service to society, education must be rooted in the life of this age. No education, with its center of being in the ages that have past, will save modern civilization. Thus every activity of the schools must derive its significance from the life of today. Whatever the subject taught, the theme must be the living of life today. Every division of the modern school has a part to play, but no activity provided for the education of modern youth holds greater possibilities for the development of moral strength, of the quality and sort needed in contemporary civilization, than does the practical-arts division of school work. The practical-arts courses came into organized education from the modern environment of

*Francis Rolt-Wheeler. *The Science-History of the Universe.* New York: The Current Literature Publishing Company, 1910, Vol. VII, p. 67.

the schools, and it deals with the same skills, facts and forces which are producing the major problems of modern society. Merely to perform the processes prescribed in the practical-arts courses will no more lead to moral education, than has the practice of these arts in the economic world produced an adequate morality for contemporary life. But an intelligent exploitation of these courses for moral ends will result in an important contribution to a genuine moral education. This contribution will doubtless come from the appreciations, the habits, the attitudes, and the ideals resulting from an effective teaching of the practical arts in the schools.

The practical-arts courses, including as they do the major vocational activities of modern man, bring into the school under most favorable conditions and in concrete manner the work of the world which surrounds the school. Children are already reacting to such work when they begin their school life, and the task of the school is to enable them to explore, to understand and to relate themselves properly to it. The significance of the practical arts as factors in both personal and social growth, and well-being, must be clearly and effectively taught. The history and present importance of these arts must be understood, and sufficient first-hand experience must be had to appreciate the inner satisfactions which result from the designing, planning and making of beautiful and needed things. No other experience is so certain to produce a sense of usefulness, of self-confidence and responsibility. The fact that skilled workers are rarely found in penal institutions is not accidental. An Illinois judge has said: "It is my conclusion, based upon observations covering a period of twenty years as a lawyer and four as a judge, that vocational training is one of the surest ways of preventing delinquency. Time after time the boys who are brought into court for the violation of law went wrong chiefly because there was nothing useful they could do. . . . "* Mr. Lewis E. Lawes, the Warden of Sing Sing penitentiary, believes that "Among the several thousands of persons at Sing Sing, and I dare say the same is true of every other prison in the country, there are hundreds of men who display inherent and latent abilities along certain lines of workmanship and mechanics, which if encouraged in early life and during adolescence would have enabled them to pursue the course of honest livelihood."** Such testimony on the negative side of the proposition has been offered repeatedly by students of crime. The rebel against society and its laws is usually the person suffering from a feeling of inadequacy. The one who possesses a feeling of ability to perform, with skill, useful tasks, and who has proved to himself his possession of powers of achievement is much more likely to place himself in a harmonious relationship to society and to assume moral responsibility. Here the practical arts taught in the schools face a remarkably important opportunity. They offer experiences in vitally interesting and socially useful activities which develop powers of creative skill and lead to both manual and spiritual achievement. The consciousness of such powers and achievement makes for moral integration and growth.

Habits Developed

One of the most tangible outcomes of the teaching of the practical arts is the development of habits. Any activity frequently pursued results in habits of some kind, and the teacher of youth finds in this fact his surest guaranty of measurable results. What the habits are depends upon the nature of the activity and the intention and skill of the teacher. In the practical-arts activities of the schools intelligent teachers, who know how to teach, find an instrument for the building of socially desirable habits which is unsurpassed in the entire curriculum. In the homemaking laboratory, the shop, the mechanical-drawing room, the commercial-education room, the agricultural laboratory, and the school garden the essential character of the work performed is such that some of the most significant habits of social life are obvious conditions of success. Among these are honesty, self-control, the assumption of responsibility, the relating of cause to effects, and co-operation. All these are either moral in themselves, or they are conducive to moral behavior. None of them will result necessarily from instruction in the practical arts, but all may be formed through this phase of school education, if the teacher intends that they shall result, and is able skillfully to utilize the necessary experiences of these courses to such ends. An examination of the opportunities frequently presenting themselves for the development of moral habits will make this clear.

Honest Work. An outstanding characteristic of the practical-arts activities, is the obviousness of the quality of work performed by the pupil. In the shop a piece of metal or wood is either square or it isn't square. It is exactly a given number of inches long or it isn't. The proper method of procedure obviously was employed or, as obviously, it was not. Pretense, "bluffing," plagiarizing, guessing, all defeat themselves of necessity, because of the very nature of the materials and problems with which the pupil deals. At no time is the teacher in doubt with respect either to the authorship, the manner of procedure, or the result. This fact places such emphasis upon honest work from beginning to end of every undertaking, that the habit is not difficult to develop. Only careless and stupid teaching will fail to secure honest work. Where opportunities for dishonesty occur in the practical-arts activities, the intelligent teacher can easily make honesty the more desirable and more efficient alternative. This is perhaps less difficult for the practical-arts teacher than for any other teacher in the school. Boys and girls are not slow to realize this situation, and honesty of work readily becomes a thing that is taken for granted in the shops and other work places of these courses. Hence the teacher has but to be vigilant at certain easily determined points, and now and again to uphold honesty as an important social virtue, valid elsewhere than in the work room, to lead many pupils to generalize from their own experiences and to make honesty an ideal of all their behavior. First, the habit formed through the necessities of the teaching situation; then the generalization growing out of a realization of the fundamental significance of the habit, is the method of capitalizing any school activity for moral-education ends.

Self-Control. In like manner the habit of self-control may be grown through the practical-arts courses. The skillful use of hand tools, of drawing instruments, and machines; the processes of the homemaking class and the agricultural project require self-control. A lack of self-control is immediately and unmistakably disastrous. Anyone, however dull, can see this fact without the teacher's aid, and very soon a beginner may be observed trying to manage his movements with restraint and effectiveness. The inevitable consequences of any lack of this important trait makes the habit begin to grow very early, and most of the conditioning factors in the situation constantly favor its rapid development. Self-control expresses itself in various ways, but in none that is not exemplified at some time in the practical-arts work of the school. It may be a matter of restraining sudden impulses of a destructive character. An alert teacher can easily prove to any normal child

*Address over Broadcasting Station WJJD, February 1, 1933. Judge Allen of Kane County Court, Illinois.

**Lewis E. Lawes, "A Challenge to the School." *Good Housekeeping*, Vol. 95, No. 3, S 1932. p. 31.

the costly consequences of giving way to such impulses, because the results to the pupil himself, of suddenly destroying the product of weeks or hours of careful and difficult effort, are quite evident in the shop or laboratory. One may in sudden anger or disgust hurl a disliked book or page of writing into the waste basket or across the room without very serious loss, but a piece of woodwork, a drawing, a bit of cookery, a newly finished garment or a row of growing plants which represent weeks of arduous toil, present a very different sort of destruction when they are similarly treated. A child unacquainted with the need for self-restraint will soon learn its value after a few outbreaks involving the work of his own hands.

Self-control, on the other hand, may mean working steadily, deliberately, and persistently instead of spasmodically and without a directing purpose. Here again the innate character of the practical-arts work projects necessitates this expression of self-control. The exactness with which the results of creative work in these fields of activity can be measured, makes carefully controlled and accurately timed movements imperative. Furthermore, skill, which always involves exact co-ordination of planned actions, is one of the important objectives of the practical-arts courses. Now, skill cannot be the result of accident. It is invariably the outcome of deliberate effort to control with precision every aspect of a performance, and to build a precise habit. Thus, self-control becomes a necessary element in the realization of the aims of the practical-arts offerings in the school.

This trait is further strengthened by the requirement, at every point, of conforming to a plan. No well-trained teacher of any division of the practical arts permits unplanned activities. Everything done is an effort to realize a predetermined end. Aimless work cannot be tolerated, and, indeed, is rarely suggested to the mind of a pupil in this area of schoolwork. Hence the pupil is held constantly in conformity to a clear-cut plan, designed to realize an end of unmistakable delineations which are ever present in his imagination as a vivid picture. This characteristic of all the practical-arts courses of the school lends to them a quality which is of the highest educative significance. Self-control becomes not a virtue laboriously to be attained by half-hearted effort to do an imposed but unwelcomed task, but it is the natural and unquestionable condition of immediate success. It is not an abstraction, but a concrete element of the project which the pupil has willingly undertaken. To translate this element of the daily work of the pupil into an ideal of the pupil's life ought not to be a difficult matter for any intelligent, competent practical-arts teacher. That self-control is a moral trait of great value, is a truism, and that modern social and economic life increasingly require it, also, is perfectly evident.

Feeling of Responsibility. A third trait essential in moral character, is the consciousness of responsibility for one's behavior. This trait is one of the most difficult to cultivate in any individual. It is the essential socializing factor in human relationships. Organized society cannot exist without it, and civilization cannot progress where it is not vigorously operative. Extreme individualism is highly immoral chiefly because it involves the utter lack of a sense of social responsibility. Obviously any educative activities where groups of persons work together can be used to promote the growth of this trait, but here, again, the practical-arts courses in the school seem to offer peculiarly favorable opportunities for its exercise and development. The consequences of one's endeavors in the shop, the drawing room, the laboratory, or the school garden are not only perfectly evident, but there can be no mistake with reference to their producer. This is the case, in part, because these activities are performed in the presence of fellow pupils and the teacher. Every member of the group knows at once who is responsible for an "accident" resulting from a wrong use of a machine in the shop, or who "burnt the bread" in a cooking laboratory. One can, however, smile in sympathy with the little boy who said, "Dad, you remember those 'rithmetic problems you worked for me last night? Well, teacher said they are all terrible and anybody must be awful dumb to try to do 'em that way." There is small chance in the practical-arts activities for any such shifting of the responsibility for mistakes, or for deliberate negligence, or other wrongdoing. Likewise, the effects of one's own conduct upon the work of his fellows, and the consequences to one of the behavior of his co-workers are perfectly evident in practical-arts class. Many illustrations of this fact can easily be enumerated by any experienced teacher of the practical arts. And, here again, a wise instructor may lead many boys and girls to a realization of their responsibility for the welfare of their fellow pupils. From this realization it is possible to move on to a dawning realization of the more abstract concept of a universal social responsibility in all the activities of life. No amount of mere verbal admonition can equal the effectiveness of the day-by-day demonstrations of the importance of being aware of the effect upon others in the same group of one's own activities and intentions. For a practical-arts teacher to overlook the opportunities offered by his work to build this moral trait solidly into the lives of his pupils, is for him to be blind to one of his own most important social responsibilities.

Relating Causes to Effects. Another significant factor in any dynamic moral living is a habitual relating of causes to their effects. The time-honored test in the courts for responsibility for criminal conduct, is the determination of the ability of the accused to realize the probable consequences of his actions. A frequent excuse offered for the misconduct of youth is, "He is too young to realize what the consequences of his actions will be." Society takes into account in numerous instances this ability in determining degrees of guilt, the responsibility of parents or guardians, validity of legal documents, etc. That it is a trait that can be grown as a result of purposeful education need not be argued. It is, indeed, one of the major responsibilities of all school education, though many teachers do not seem to realize its significance. Moral conduct is far more than conventionally acceptable behavior. To be moral one must be able to see and consider the possible effects of behavior, and he must habitually consider them before they are actually produced. The truly moral person never loses sight of the possible social outcome of a tendency, a mode of action, a belief or an attitude. There can be no moral progress either of an individual or of a people without a sensitiveness at this point. Hence, any school activity which contributes to the habit of considering the ultimate results of present or proposed action contributes heavily to moral education. Any school subject may be made to aid in the growth of this habit, but the practical-arts courses are so constituted, of necessity, that they force the continuous relating of causes and effects in the pupil's mind. The characteristic *project* of the practical-arts courses requires a clear understanding of the means to be used to reach the definitely established ends sought. All the pupil's work involves this process inevitably, and here, as in the other possible moral contributions suggested, the stupidity or indolence of the teacher is the only obstacle to the development of the habit of looking beyond present impulse and con-

duct to the consequences. The good teacher will skillfully aid the pupil to broaden this habit to a wide area of social life.

Co-operation. Then, there is the moral trait of co-operation. Morality involves the spirit of co-operation. Indeed, co-operation has very little meaning otherwise, and since this spirit seems to grow only under the most careful tuition, education which intends to produce moral conduct must train in social co-operation. Notwithstanding the large place given to this moral trait in educational objectives there is all too much neglect of its cultivation. Too many courses are organized so as to exercise one's individual powers without relation to the activities of his fellow pupils. A large amount of wholly individual instruction for individual ends, of course, has to be given, but it is easy to overemphasize individual endeavor which is unrelated to the work of one's fellows. There are few places outside the school where one must play a "lone hand." Almost every activity of life, aside from school study, is a co-operative activity, and children need more purposeful training in the power to co-operate effectively than they receive in most school instruction. At this point the practical-arts courses can make another important contribution. Because these courses are not merely the learning and reciting of facts, but involve co-operative planning and working together, they lend themselves most readily to conscious efforts in co-operation. Effective co-operation requires training, and to give such training it is necessary to plan for it. This can be done by organizing the courses so that projects may be chosen in harmony with family or other group needs. All the practical-arts courses lend themselves readily to such an organization. Besides, frequent use of so-called "community" or group projects can be undertaken. In such undertakings a twofold contribution is made in that the actual planning and working out of the project is a typical co-operative enterprise, exactly of the character of those found throughout social life generally; and, second, the willingness to undertake a group project by a class of boys or girls rather than to make something for themselves individually, comes only from social forethought, and a social attitude. The wise teacher will not neglect the many opportunities for training in co-operation which are presented in the practical-arts activities of the school.

Development of Ideals

In all that has been suggested here as available means of moral education in the practical-arts courses, the emphasis has fallen upon training activities and habit development. One finds, however, that moral living, to be dependable, must involve more than mere habitual behavior. The complexities, and the tendencies toward rapid change, which characterize modern civilization, make necessary a large equipment of *moral ideals*, if one is to treat with life ethically and effectively in more than a very few familiar areas. The necessary flexibility and versatility require broad principles and ideals as foundations, else they express themselves as mere opportunism. Education, therefore, must concern itself not only with the production of a variegated supply of moral habits, but it must attend particularly to the creation of socially desirable ideals. Now, ideals may be the products of knowledge and reasoning, but they become effective in the realm of emotion. The pull of an ideal is essentially an emotional pull. Hence, any agency of moral education must find a way to build out of educative experiences broad, moral desires. No school subject can be of great value to moral education unless *moral purposes* grow from it. Here, again, the practical-arts activities may make an important contribution. By capitalizing fully the easily demonstrable values of honesty, as it shows itself, day by day, in the products of the pupil's hands; of self-control as the pupil's experiences reveal it to him; of a sense of responsibility as it consciously grows upon the boy or girl; of the unfailing connection between cause and effect as it discovers itself again and again; and of co-operation as its necessity is inevitably forced upon the pupil, ideals can be brought to birth naturally and without undue advertisement. Often the teacher needs only to suggest the formulation of the ideal in words to enable the pupil to establish it in his consciousness. An occasional mention of the formulated ideals serves to keep them alive. In some cases, quiet, informal discussions of the moral ideals which come into view as a result of the pupil's experiences will serve to start them growing in his consciousness. Some boys and girls are able to find the meaning of their experiences in larger moral purposes without aid, but in most cases the timely, tactful assistance of a watchful teacher is requisite. In no case is a practical-arts teacher justified in overlooking the final step in all his teaching, namely, the bringing into being of the integrating *life ideals* which the pupil's activities suggest. The full value of the practical-arts courses as means of education is never fully realized until this step is taken.

The Teacher's Part

Throughout this discussion the part played by the teacher has frequently appeared. Educators in recent years have placed a wholly unjustifiable faith in curriculum construction, and too often have overlooked the fact that the curriculum at best is only a set of tools that must be wielded by skillful craftsmen upon appropriate materials to be of value. Hence, for any school course to make an important contribution to moral education it is clearly necessary that a skillful teacher purposefully use it to that end. The practical-arts courses can be utilized effectively in moral education. Their inherent character and the necessary procedures involved in their pursuit make them peculiarly well-fitted to such a purpose, but they will not of themselves, produce moral character. The practical-arts teacher is, after all, the responsible agent in such an outcome, and he must be trained to see and feel this responsibility, and to use his opportunities to the utmost for the desired ends.

Individuals become moral by desiring to be moral, and through trying to make the necessary adjustments in their behavior to produce moral character and conduct. A fear of priggishness and pedantry has led some to insist that the most desirable morality is that which is unaware of itself and is purely habitual. Such morality is effective so long as an individual moves within a familiar environment, but it offers insufficient insurance of moral behavior in new and unfamiliar situations. Here a strong desire to behave morally together with clearly envisioned ideals must be firmly held to Hence, as urged above, there must be somewhere in the educational experiences of most children, an effort to lead them to develop definite ideals of moral living as well as habitual moral behavior. Thus the teacher becomes extremely important to the realization of moral outcomes in education. But a teacher who himself does not possess high moral ideals and who is not well equipped with moral habits is unable to capitalize his teaching material for moral ends. Practical-arts teachers, therefore, should be chosen not alone on the basis of technical knowledge and professional training, but as well upon evidence of moral purpose and ability to make use of the elements of their field of teaching which are conducive to moral education. To such teachers the practical-arts courses offer a means of making a most significant contribution to the moral education of modern youth.

Trades vs. Occupations as Training Bases

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An interesting study of special value to teachers of vocational subjects.

The term *trade* has become confused in meaning to many individuals who are concerned directly or indirectly with industrial training. The term may apply to occupations requiring several years in formal study and experience, or it may apply variously to any occupations which enable workers to make a living. Academic men in particular become confused because they are usually unfamiliar with what the worker actually does, how he does it, and the conditions under which the work must be done. The differences are not sufficiently clear to many writers in the field to enable them to make proper distinctions. Then, too, the increasing complexity of activities of industry creates problems for those who are directly interested in training industrial workers.

The word *trade* is probably rapidly becoming a misnomer and should give way to a broader term. Perhaps the term *occupation* would be more satisfactory. The writer took part in a conference not long since which involved planning for the training of apprentices. The conditions of training were that "there must be bona fide trade training" in whatever plan was devised. This statement by certain members of the conference group meant exclusion of repetitive industrial workers from assumed unneeded training. To others it meant a narrowing of the service of apprenticeship to a seemingly growing minority of industrial workers. Those believing the latter, appreciated that there are many workers in industry who cannot be classified as tradesmen, or all-around skilled mechanics, because their responsibilities, and needed abilities, are so complex as to require a long period of training for development. There are occupations of a more or less repetitive kind that are intricate in function, that require judgment-forming of the highest type in using precision instruments, and that require high degrees of manipulative dexterity. Yet, these workers are frequently excluded from classification as tradesmen, because a tradesman is assumed to be a *skilled mechanic* or *craftsman*.

A *skilled mechanic* knows, and can work at, all the operations of a trade, and can carry them through to the completion of any project in the trade. The *operative* is a repetitive worker who is required to perform from day to day one operation, or a short series of continually repeated operations on a particular machine, or by hand. He is frequently excluded from favorable consideration in training plans because the training he needs does not embrace a trade.

A case in point is the work of the assembler. In industry the designation of assembler may have many meanings, but it refers to repetitive fitting and assembling of various units of a product. The assembler is usually classed as a repetitive worker, rather than as a tradesman, even though there are many instances when assemblers do custom work that requires skill and judgment-forming of complex nature.

Work on the boring mill is also illustrative of a type of work that frequently fails to attract discriminating attention. Much of the work on the boring mill is more involved than is the work of some skilled trades. Yet, a boring-mill worker, if his work is repetitive, may not be classed as an all-around skilled mechanic, even though the duties are so complicated that a long period of training is necessary for the development of an efficient worker.

Many of the great multitude of industrial jobs are difficult for the uninitiated to characterize because of the fact that a simple but frequently unrecognizable principle may serve as a basis for identification. A worker may be an operative if his work is of a repetitive nature, or he may be a skilled mechanic if he does custom work. There are repetitive workers whose duties are more complicated and require higher abilities and training than do many so-called skilled mechanics.

One implication is easily apparent to the trained observer. Lines of characterization of mechanics and operatives are becoming less and less discernible. Recognition for training should be given workers according to the degree of manipulative ability and judgment-forming required, rather than by classification according to trade or nontrade groups. Training should be made available to all who need it, provided that such training is necessary, and that it is suitable for a useful occupation. The term *useful occupation* is broader in meaning, yet more justly inclusive than is the term *trade*. It is a modern, practical concept, in keeping with the rapidly changing conditions of work in industry.

In verification of this concept, a classification procedure was established which assumed grouping according to skill, judgment, and learning time required to function on the job. That is, workers were placed in classifications ignoring the customary grouping which recognized only skilled mechanics and operatives, but placement was made according to abilities. The proper placement in groups according to abilities was made on a basis of experience with, and study of workers in Twin Cities industries.[1] The types of work performed were classified in five groups of assumed abilities. These abilities ranged from the simplest to the highest type of factory work. The groups were referred to as classes A, B, C, D, and E. There were 480 cases of which 15 were in Class A; 106 in Class B; 78 in Class C; 98 in Class D; and 183 in Class E. Once the groups were established the workers were given a battery of tests to determine the significance of the new classification. The tests chosen, Table I, represent a variety of human abilities, such as mechanical ability and dexterity, academic, clerical and spatial recognition abilities, and personal characteristics.

The workers in Class A are of the highest type found in industry.[2] They perform the most intricate kinds of work without immediate supervision. They can plan and carry out their many exact procedures on the most delicate pieces of work. They work accurately without the use of jigs. Such

[1] Fryklund, Verne C. *Selection and Training of Modern Factory Workers.* Minneapolis: University of Minnesota Press, 1934.
[2] *Ibid.*

workers are found on experimental jobs, model work, and in fine-instrument making. Included in this class are electrotypers, watchmakers, engravers, master paper makers, die sinkers, custom job workers who work on engine lathes, boring mills, planers, and other similar machines used in making complicated parts with tools that are not pre-set and where a mistake would be costly. This work requires men whose abilities are unmatched by the common strata of skilled mechanics.

Class B workers can perform all the operations of a trade, but they need supervision, and the work is usually preplanned. They can read blueprints, they know materials and speeds, and can use precision instruments such as micrometers and gauges. The work in this class may be custom or repetitive to the extent of a few operations. Accurate work is required and tools are not pre-set. In this class there are engine-lathe workers who do rather laborious but not highly accurate work, patternmakers of simple patterns, zinc etchers on newspaper plates, printers who do ordinary printing, bricklayers, cabinetmakers, finish carpenters, and auto mechanics.

Class C includes the higher types of specialists or operatives. They perform by machine or by hand, operations that are highly repetitive. They must use gauges and other means of control, the work is preplanned and tools are pre-set. The workers, however, understand the machines and can change tools as found necessary. Among these workers are turret-lathe operatives, engine-lathe operatives who do simple turning where accuracy limits are not close, printing-press operatives, sewing-machine operatives on careful work, hand ironers in laundries, and armature winders.

The jobs in Class D are extremely simple and highly repetitive. The workers must possess speed and manipulative dexterity. Two weeks or less is the usual training time for mastery of any job in this class. These workers are numerous in modern industry. A few of them are operatives on drill presses, punch presses, cranes, riveting machines, looms, and simple woodworking machines; then there are machine helpers, chippers, filers, stockmen, packers, mica graders, and inspectors.

Class E is the unskilled labor group. Training, skill, accuracy and knowledge are not necessary. The work is rough and simple. Typical of such workers are truckers, sweepers, ashmen, teamsters, chip-haulers, pick and shovel men, longshoremen, stokers, mortar mixers, hod carriers, and lumberjacks.

Placement according to percentages in each class showed, among 4,040 workers in Twin Cities plants, that 2.8 per cent were in Class A; 7.8 per cent in Class B; 33.7 per cent in Class C; 44.5 per cent in Class D; and 11.1 per cent in Class E. These percentages were calculated prior to validation of the classes. Subsequent validation of the classes by ability tests verified these percentages. It can be said that workers in industry group themselves in the above proportions if the above number of cases can be said to be a good sampling.

Evidence of the probable significance of the classification procedure is shown in Tables I and II. Class E is not summarized in Table I because a casual-labor group was tested some time prior to the testing of the other classes.[3] There was some necessary modification in the tests and the results were low.

TABLE I. Summaries of Scores of Various Classes of Factory Workers in Several Tests*

Tests	*Class D*	*C*	*B*	*A*	*Total*
Age					
Number	98	78	106	15	297
Mean age in years	33.1	34.9	37.7	34.2	35.3
Standard deviation	10.6	10.3	9.8	7.5	10.3
School grade reached					
Number	97	76	106	15	294
Mean school grade	7.9	8.2	8.2	11.1	8.3
Standard deviation	2.2	2.1	2.0	3.4	2.2
Educational ability test					
Number	80	56	92	13	241
Mean test score	34.0	39.3	39.5	65.8	39.0
Standard deviation	18.5	17.0	19.1	19.8	19.7
Clerical aptitude tests					
Number Checking					
Number	86	54	89	13	242
Mean test score	73.8	72.4	74.6	106.5	75.5
Standard deviation	27.4	22.9	23.3	38.2	26.8
Name Checking					
Number	84	47	86	10	227
Mean test score	63.6	70.1	65.2	110.0	67.6
Standard deviation	32.5	27.2	27.0	40.8	31.4
Dexterity tests					
Finger					
Number	98	78	106	15	297
Mean time score	282	293	282	276	282
Standard deviation	45.6	46.8	19.2	27.6	46.8
Tweezer					
Number	98	78	106	15	297
Mean time score	372	366	354	336	360
Standard deviation	84.0	54.0	66.0	36.0	72.0
Manual: placing					
Number	63	46	71	4	184
Mean time score	243.0	235.7	237.1	...	238.3
Standard deviation	25.5	18.5	20.6	...	22.3
Mechanical ability tests					
Minnesota Mechanical Assembly					
Number	98	78	106	15	297
Mean test score	255.2	284.1	291.1	293.2	277.5
Standard deviation	41.0	19.2	15.7	18.0	31.8
Minnesota Spatial Relations					
Number	98	78	106	15	297
Mean time score	1372	1281	1192	1063	1268
Standard deviation	356	317	284	141	325
Personal inventory					
Emotional stability					
Number	87	50	87	10	234
Mean test score	—58.2	—74.0	—72.9	—30.0	—65.8
Standard deviation	87.9	69.5	77.8	73.9	80.6
Self-sufficiency					
Number	87	50	87	10	234
Mean test score	15.7	22.8	27.2	41.0	22.6
Standard deviation	40.6	41.6	48.9	38.2	44.4
Extroversion					
Number	87	50	87	10	234
Mean test score	—39.5	—49.2	—43.7	—18.0	—42.2
Standard deviation	53.1	38.9	49.2	41.4	50.7
Dominance					
Number	87	50	87	10	234
Mean test score	36.2	33.2	43.6	2.0	38.5
Standard deviation	56.4	55.3	56.1	75.5	55.8

[3]Hanson, A. H., Trabue, M. R., and Diehl, H. S. *The Duluth Casual Labor Group*. Bulletin of the Employment Stabilization Research Institute. Minneapolis: University of Minnesota Press, 1932.

*After Verne C. Fryklund. *Selection and Training of Modern Factory Workers.* University of Minnesota Press (1934).

TABLE II. Comparisons of Test Performances of Various Classes of Factory Workers*

Tests	*Classes Compared* D and E	C and D	B and D	B and C	A and B
School grade reached					
Difference	2.4	0.3	0.3	0.0	2.9
Difference ratio	7.8	0.7	1.0	0.2	3.2
Educational ability test					
Difference	‡	5.3	5.5	0.2	26.3
Difference ratio	‡	1.2	1.9	0.1	4.5
Clerical aptitude tests					
Number Checking					
Difference	8.2	—1.4	0.8	2.2	31.9
Difference ratio	2.1	0.3	0.2	0.5	2.9
Name Checking					
Difference	‡	6.5	1.6	—4.9	44.8
Difference ratio	‡	1.2	0.4	0.9	3.4
Dexterity tests					
Finger					
Difference	66.0	—12.0	0.0	12.0	6.0
Difference ratio	8.7	1.7	0.2	1.5	0.8
Tweezer					
Difference	156.0	6.0	18.0	12.0	18.0
Difference ratio	9.5	0.8	1.8	1.1	1.5
Manual: placing					
Difference	‡	7.3	5.9	—1.4	‡
Difference ratio	‡	3.7	1.5	0.4	‡
Mechanical ability tests					
Minnesota Mechanical Assembly					
Difference	9.9	28.9	35.9	7.0	2.1
Difference ratio	1.8	6.2	8.1	2.6	0.4
Minnesota Spatial Relations					
Difference	273	91	180	89	129
Difference ratio	4.6	1.8	3.9	1.9	2.8
Personality inventory					
Emotional stability					
Difference	3.3	15.8	14.7	—1.1	—42.9
Difference ratio	0.2	1.1	1.1	0.1	1.7
Self-sufficiency					
Difference	6.3	7.1	11.5	4.4	13.8
Difference ratio	1.1	1.0	1.7	0.6	1.1
Extroversion					
Difference	6.8	9.7	4.2	—5.5	—25.7
Difference ratio	0.97	1.1	0.5	0.6	1.8
Dominance					
Difference	9.5	—3.0	7.4	10.4	41.6
Difference ratio	1.3	0.3	0.9	1.1	1.7

*The direction of the difference always favors the first-mentioned class except when a minus sign precedes the difference.
‡Number of cases too small for comparison, or tests not taken.

The columns in Table II and the rows to the right of the term *difference ratio* contain the data which indicate the extent of significance of the classification procedure. The difference ratios are computed by means of the standard formula, the difference divided by the standard deviation of the difference. If the difference ratio is less than 1.00, there is probably no statistically certain difference between the classes compared; if the difference ratio is between 1.00 and 3.00, there is a possible difference; if the ratio is 3.00 or more, there is practical certainty that the difference would be in the same direction were similar classes to be examined.

Examination of the difference ratios between classes shows that important differences appear when considering the abilities that might be expected of the classes in their respective work. Class A excels the next lower class in educational, clerical and spatial recognition abilities. Class B excels the next lower class in mechanical assembly ability, and excels to a marked degree in dexterity. Class C shows superiority over the next lower class in dexterity and mechanical assembly ability. Class D is superior to the lowest class in finger and tweezer dexterity, and spatial recognition ability. An important difference appears in clerical and mechanical assembly ability. In all other comparisons between classes there are possible differences.

This is not intended to prove that workers in industry should be classified into groups designated by letters, even though such a procedure would be useful for training purposes and evaluation of services. In this instance, the grouping serves as a convenience for measuring and comparing workers of assumed abilities without regard for trade lines. Although the majority of workers in classes A and B are mechanics, there are repetitive workers among them. There are mechanics in Class C although the majority are repetitive workers of a high type.

It could also be said that when workers are grouped on the basis of abilities necessary for success on the job, those with highest ability tend to fall in groups according to trade jobs, and those of lowest ability tend to fall in groups according to non-trade jobs. This is relative.

These observations are useful for the individual interested in the abilities of industrial workers, but the most important implication is that abilities and required training do not necessarily follow trade lines. Training should be given when and where it is needed, whether in short or long terms. Of course, versatility should also be encouraged. Whether the work falls into a category of *useful occupations* regardless of trade classification would be an important question. Persons who would qualify under the specifications given for Classes A, B, and C obviously need training. The training time would vary; the A workers needing most and C workers needing least training. Persons wishing to qualify as D and E workers require but a few days of adjustment on the job. The flow of advancement would be from D to A. Workers whose duties correspond to the specifications for Class C have responsibilities that equal in large measure those of the skilled mechanics who fall in Class B.

The evidence shows objectively that trade lines can be ignored when attempting to determine whether or not training is deserved. It shows also that training agencies, with short unit offerings, are justified in attempting to shorten still further, rather than enlarge, the offerings to involve longer periods. This essentially is the practice in many American trade schools. As the jobs subdivide in industry, the training likewise changes in the direction of short unit offerings.

SPECIAL REQUIREMENTS

Special rules, standards, and stipulated technical requirements are implements in the hands of supervisors and administrators to eliminate the unfit. Such rules seldom affect the good teacher. On the contrary, the application of carefully formulated rules will elevate the fit, while they make life miserable for the lazy, the slothful, and the untrained.—*Earl L. Bedell.*

Strengthening Industrial-Arts Testing and Guidance

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A method of using tests in order to determine what guidance procedure to follow.

The scientific movement in education has done much to bring forth tests and improve testing techniques, but, in all too many cases, there the matter has been dropped!

Guidance, which naturally and logically follows any testing program, has not been a carefully integrated part of the whole program. Many factors make up the sum total of a well-rounded testing and guidance program, and these factors should be procured and arranged in a simple objective way for ready use of the counselor. This article deals with *testing*, and is particularly concerned with the problem of guidance.

The "Symposium on Testing" reported in *Epsilon Pi Tau's Review* of 1931 laid a splendid groundwork for the study of testing for the industrial-arts teacher. The present article is based upon this previous study.

Dr. Harold A. Edgerton, one of the original committee members on the Minnesota study, directed an investigation on mechanical ability of some 500 junior- and senior-high-school students in the Fairview School, checking back against the results of the Minnesota study. This was a factor analysis on the organization of mechanical ability, originally reported by Van Horn.[8] The findings of this study were essentially the same as those worked out at the University of Minnesota. A further step was developed from these same test data by the writer in a master's thesis,[1] which used four variables arranged in categories for purposes of guidance in industrial-arts classes.

The Stenquist assembly and paper formboard tests of mechanical ability were combined by a method described by Garrett,[3] which uses medians. The intelligence score, shop average, academic average, and combined mechanical-ability test scores are the four categories used to characterize the various types of students studied. The scores comprising the categories are placed arbitrarily above and below the median. This is not so fine a classification as might be used, but is indicative of a method.

These categories in the writer's study were arranged into pattern distributions for the seventh, eighth, and ninth grades, as may be seen in Table I. The procedure for obtaining the 16 unique patterns described by Toops[7] is an application of the geometrical addend code. Toops, in his glossary, defines this system of coding as follows:

"A precoded series of addends, 1, 2, 4, 8, . . . for the several successive answer categories, such that the code number of a multiple-answer response pattern is found simply by adding the categories checked by the respondent."

As used here, the addend is always zero if the pupil is *below* the median in the trait concerned; and if *above* the median, the addends are: mechanical ability, 1; intelligence test, 2; shop average, 4; and academic average, 8. In the pattern description (Table I) the subscripts *l* are for lower than the median, and *h* for higher than the median.

Table I shows 16 unique patterns into which cases may be classified by their scores on the four variables mentioned above. From the distribution obtained in this table a trained teacher or counselor may fit any case tested into a pattern. With this pattern in mind a skeletal procedure for guidance may be formulated insofar as is possible with only these four variables as indicators. From the distribution in Table I it may be seen that a boy placing in the unique pattern number 0 (low in all four variables) shows a need for a great deal of further information on his particular case before an adequate diagnosis can be given.

Pattern I would indicate that since he is high in mechanical ability (measured by the two tests used) but low in shop average, there is a distinct need for a critical survey of his shop achievement as determined by these grades.

Pattern 2 seems to indicate that since he is low in both mechanical ability and shop average, he should be studied in regard to academic average, which is

TABLE I. Pattern Distribution of Four Variables: Combined Mechanical-Ability Test Scores, Intelligence, Shop Average and Academic Average; Grades 7, 8, 9

Pattern Number	*Pattern Description*			*7th Grade*	*8th Grade*	*9th Grade*	*Total*
0	M_l	I_l	S_l A_l	9	9	11	29
1	M_h	I_l	S_l A_l	1	7	8	16
2	M_l	I_h	S_l A_l	4	9	7	20
3	M_h	I_h	S_l A_l	3	6	8	17
4	M_l	I_l	S_h A_l	2	5		7
5	M_h	I_l	S_h A_l		4	4	8
6	M_l	I_h	S_h A_l		2	4	6
7	M_h	I_h	S_h A_l		3	4	7
8	M_l	I_l	S_l A_h	4	3	2	9
9	M_h	I_l	S_l A_h	3	2	3	8
10	M_l	I_h	S_l A_h	2	3	6	11
11	M_h	I_h	S_l A_h	5			5
12	M_l	I_l	S_h A_h		4	5	9
13	M_h	I_l	S_h A_h	3	5	6	14
14	M_l	I_h	S_h A_h	2	5	4	11
15	M_h	I_h	S_h A_h	1	7	11	19
Totals				39	74	72	196

The Minnesota study of mechanical ability[6] has had few improvements or further investigation since its publication in 1930. During the years 1932–33

[8]All of the footnote indices used in this article refer to the number of the respective book in the bibliography at the end of the article.

low and not in proper relation to his intelligence grade. It is also likely in this case that both the academic and shop averages might be raised (the academic higher, perhaps) after proper diagnostic and remedial measures have been applied.

Pattern 3, where the mechanical ability and intelligence are high and both academic and shop averages low, suggests a need for close scrutiny of both grade averages for diagnostic purposes.

Pattern 10, where the mechanical ability and shop average are low and the intelligence and academic average are high, suggests that it is entirely likely that the boy would be more successful in academic work.

Pattern 13 is high in all variables except intelligence. A case falling into such a pattern would suggest a strong interest in schoolwork and the application of considerable industry in the achievement of a high academic average.

Pattern 14 would indicate that while the boy may lack general mechanical ability, as indicated by the two tests used in this study, he is still able to achieve a high average in the shop, as indicated by grades. It is likely that a careful investigation should be made of the shop grading system.

Pattern 15 seems to be a very happy situation and presents no problem of guidance other than perhaps a closer scrutiny of the boy's interests, with direction in favor of the strongest of those interests.

It must be remembered that this skeletal procedure for guidance purposes must be combined with a great deal of common sense. There are many other factors which will eventually be measured objectively and made a part of such a procedure. Some of the more important of these factors to be kept in mind when counseling include:

A necessity for knowing something about the kinds and intensity of an individual's interests. As long as this knowledge is lacking, neither educational nor vocational guidance can have a solid foundation. The problem of measuring interests has been treated by Fryer.[2] Hull[4] takes up the factor of interest in or the liking for a given activity connected with industry. This is a second important factor to be considered in guidance along with the pattern-distribution data:

> Indeed, liking for a given kind of activity undoubtedly determines in large part the amount of industry and success displayed in it. It is notorious that people find time to do the things they like to do and discover an astonishing variety of excellent reasons for not doing the things which they dislike.

Kelley[5] had teachers rate first-year high-school students on intelligence, industry, and interest in their work. He then sought to determine the relative part contributed by intelligence (capacity) and industry in determining scholastic success as measured by the average mark at the end of the year. He finally concluded, after considerable statistical analysis, that intelligence and industry contribute to scholastic success about in the proportion of 60 to 40, respectively. Interest of high-school students in their work as judged by teachers was correlated +.68 with industry and conscientiousness. This indicates a very considerable similarity, as such relations go, though by no means is a complete identity. When the two factors were definitely compared as to their importance in determining (estimating) average scholastic success, Kelley found that the interest factor was only about half as important as industry. If parallel conclusions may be drawn from these factors of success in industrial-arts classes, then it may be said that industry and interest are two important factors to be considered in connection with mechanical ability (capacity) as measured in a testing program. This opens up a field which would bear further investigation by industrial-arts teachers. The matter of industry or conscientiousness has not been objectively measured as yet.

The factors of health, physical strength and co-ordination, social adjustment, home conditions, shop grades as indicators of mechanical ability, a wider range of tests of mechanical ability, all need to be considered carefully in the complete guidance procedure. When one stops to realize what a relatively small number of industrial-arts programs employ valid measures objectively, is it any wonder that they ultimately have trouble? This whole question of desirable relationships seems to involve considerably more than manipulative techniques.

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Extracurricular Activities

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This subject, teaching as it does instructor and students alike, is assuming greater importance with every year.

The increase in leisure which seems probable in the near future presents a real challenge to our public schools. Opportunities for leisure-time activities in and out of school must be provided and in addition added interests and habits must be trained so as to result in a richer and more satisfactory life. There is considerable concern as to whether the schools are doing all they ought to prepare our young people to face a new situation which involves more leisure time. We find that the N.E.A. in 1918 set forth seven objectives of education and one of the seven was "Training for the worthy use of leisure." The National Congress of Parents and Teachers adopted the same objectives. The National Recreational

Association has for over 20 years concerned itself with the use of leisure time directing the play spirit and community recreation. The National Physical Education Association has been interested in helping state departments by issuing programs and bulletins for the use of those interested in leisure-time, play, and recreation activities.

Our teachers have been trained to cope with one objective, their principal job, school teaching, and have not laid much emphasis on the worthy use of leisure when as a matter of fact their job occupies only a small part of their life. While we should prepare ourselves for the vocational objective we should not avoid the avocational. We should be concerned with the community forces which react on our youth during their leisure time, we should be concerned about after-school and vacation time.

To be sure, there are other agencies besides the schools which are interested in this problem, such as the parents, the church, and social agencies, but we have become accustomed to depend upon the public school for the training of youth even though the schools have them under their care but a fraction of the day.

The Federal Department of Education has this to say:

> The development of school clubs on an extensive scale now found in the public high schools represents a criticism leveled against the school curriculum. Evidence of the truth of this statement may be found in the rapid increase in the number of clubs during the past 15 years and in the character of the clubs formed. If the school curriculum had been based more upon pupil activities taken from normal living experiences and in accordance with the interests and aptitude levels of the different age groups there would not have been felt the extreme need for school clubs as is indicated by the great number and variety of clubs now organized in the public high schools.

Changes taking place in educational practice may be illustrated by the following statements:

> Education is not a preparation for life, it is life.
>
> The child learns to do by doing.
>
> The school curriculum should be composed of functional activities representative of normal experiences in life.
>
> Individual differences in pupils as to aptitudes and interests are to be taken into consideration in providing an educational program.
>
> Pupils are to be provided with opportunities for self-expression in a variety of media.
>
> Provisions are to be made for exploration in a variety of activities.
>
> Opportunities are to be provided for the exercise of initiative.
>
> The educational program is to contribute to social adjustment.
>
> The educational program should include opportunities for training the individual to do better those desirable things which he will do anyway.

At least one reason, and an important one, for the ready acceptance of club work in the high schools is the fact that changes in the school curriculum to meet new conditions in education are not readily accomplished. A great deal of inertia exists in the school program; because of this, new subjects are often brought into the school as extracurricular activities. Into this scheme the school club fits well.

Play in work or interest in work has been the motto of many industrial-arts teachers and their success in life can be measured very largely by their ability to develop interest. Students usually elect industrial subjects because of their interest in manual work, but the variety of manual occupations offered in the average school is so limited that exploratory work in any considerable number of occupations is impossible.

In order to enlarge the horizon of possibilities many teachers have organized clubs which meet at regular times during the school day, or if that is impossible, after school hours.

One requisite for success in club work is adequate organization and definite aims. The teacher should be responsible for the organization and aims, but beyond that he should shift the burden on the shoulders of students or their representatives. Since interest is the big factor in the success of club work the teacher should select from a long list of possible club activities that subject in which he is personally very much interested, otherwise the work will become burdensome. The club organization should be as simple as possible yet effective, the aims and objectives should be as definite as the requirements for membership, such as pupils with common interests and similar abilities.

The club should stimulate reading, and pupils should be encouraged to bring books and magazines for the use of various members. A bibliography should be prepared by the teacher so those who desire may purchase reading material pertaining to their work. Some of the aims of club work should be: development of handyman activities; providing exploratory studies for the discovery of aptitudes; providing activities for the pursuit of hobbies; and the construction of things of value. Clubs also can be organized for the purpose of making visits to industrial plants. Industries have multiplied in recent years to such an extent that it is impossible to offer activities in the public schools that will be truly representative. One of the values of shop visits is that they present actual conditions surrounding particular trades or occupations which cannot be shown in the school atmosphere.

There are certain difficulties encountered in organizing shop visits which must be considered before they are undertaken. If taken during the school day they will interfere with the time schedule. The possibility of accidents makes it necessary for someone to be responsible for the safety of the members of the club. Some concerns do not care to have their work interfered with by releasing foremen or superintendents to act as guides. Then, too, transportation to and from the school sometimes becomes a vital factor, and then there also is the tendency of some pupils to waste their time by play or inattention. These and other problems may be solved if the visit is well organized by the teacher before it is undertaken. The firm to be visited should be convinced that the visit will be of importance from an educational standpoint. The pupils should be coached in the important things to be seen and studied.

If a factory, the teacher should be well informed on the product and the spread of its use over the country. After the visit, one club period should be devoted to reports of observations and answering of questions that will suggest themselves to the pupils during or subsequent to the visit. A summary of the values obtained by the visit should be sent to the management as a matter of courtesy. Co-operation with the English department will make these write-ups or reports of increased value to the pupil.

At Falmouth, Massachusetts, a maintenance club has been organized for the purpose of keeping the school building in good repair. Members of this club have rooms assigned to them for which they are responsible. Destruction or defacing of property is reported weekly and repairs made so far as possible. The fact that there are inspectors authorized by the principal has a restraining influence on the naturally destructive boy and the results have shown fewer repairs since this club has been organized.

In some of our own schools we have a stagecraft club the aims of which are the preparation of scenery and equip-

ment. This calls for considerable artistic ability as well as experience in the use of woodworking tools. These clubs cooperate very closely with the English and dramatic departments and afford opportunities for considerable reading and research.

In 1930 there was organized a junior-mechanics club similar in purpose to the boy scouts, the 4H clubs, and the future farmers of America.

The purpose of this club is to organize all types of industrial work in the junior high schools under several units and to grant recognition of good work by pins of various designs indicating the amount of proficiency and the number of completed projects.

The work may be done in the school shop or in the home shop and provides for individual accomplishments. There are over 100 of the junior-mechanics clubs in 19 states, and teachers say the beneficial effects are widespread, especially as they provide for the proper use of leisure, satisfy the gang instinct, grant opportunity for exploring a wide range of occupations, assist in the work of the vocational-guidance counselor, and offer many other worth-while results.

The initiation of new members and granting of degrees are accompanied by regular exercises and ceremonies.*

Many teachers have developed the home-workshop idea to the extent that credit is given for work done at home. Parents can do more than teachers in encouraging their boys to use leisure time at home by providing them with well-equipped home shops.

Some schools assist in this endeavor by offering class projects that will be of value to the home worker, such as lathes, jig saws, circular saws, drills, etc. If these machines are made in the school their cost is reduced to the point of being obtainable by a large number of boys who otherwise could not afford them. Boys who spend their time taking up vocational subjects in addition to regular schoolwork will have little time to come in contact with the law. Teachers can contact parents at the P.T.A. meetings and in this way stimulate them to offer this worth-while opportunity.

The life history of James J. McCabe, formerly District Superintendent of Schools of New York City, exemplifies some of the values of avocations. While working as a printer he took up music as an avocation and later became a teacher of music; he meanwhile took up mathematics as an avocation and became a teacher of mathematics; later he became district superintendent. While engaged in administrative duties he studied art and before his death at 70 years saw one of his paintings hung in the Paris salon. Mr. McCabe led a full, rich life because of his avocational interests.

A survey of literature in this field shows certain basic principles which are given here:

1. A definite time allotment.
2. Each club should be sponsored by a faculty member.
3. All meetings should be attended by the sponsor.
4. The principal's permission should be granted before organizing.
5. There should be absolute democracy of administration.
6. All meetings should be held in the school building.

Extracurricular activities have resulted largely from pupils' protest against formal, abstract, deferred subject matter of the average curriculum, and the result in many instances is the success of the extracurricular activities at the expense of formal studies.

Dr. Dewey is perhaps the best-known promoter of this movement and in part this is what he says:

"The formal point of view of the average administrator is that pupils should learn what the human race has accumulated, while we insist on the continuous personal growth of the child. There is an instinctive desire among young people to associate in some form of group organization, this should be properly directed and not suppressed, the fault of high-school principals is in not taking advantage of this instinctive desire."

Because clubs foster initiative and self-expression they should be more informal than the regular school organization will allow. The club movement when properly directed and controlled will receive the approval of school patrons. Students who are active in club work are overwhelmingly in favor of continuing and improving this part of the school curriculum.

Extracurricular activities will not reach the heights toward which they are directed until they are sponsored by specially trained instructors, and our normal schools have been slow in recognizing this training as a part of their responsibility. A questionnaire sent out by the Oswego Normal School revealed the fact that most industrial-arts teachers were expected to develop one or more extracurricular activities and their opinion was that due to the increasing interest in this form of work, the normal schools should provide at least one semester of required training for the potential teacher.

Teachers have similar opportunities for doing club work, such as boy-scout and manual-arts club work. I feel that it is as important for teachers to have a hobby as for pupils, and these two lines of work offer opportunities which should not be passed by. Boy-scout work is a splendid field for industrial-arts teachers. They seem to fit in very well as scout masters and vocational advisers, and many teachers have won enviable reputations by their interest in this very much worth-while work.

Teachers of industrial arts in large urban communities can form teacher's clubs, which will also offer memberships to the teachers of surrounding near-by towns. St. Louis has such a club which provides monthly programs of two addresses, one by a teacher and one by a principal or superintendent, this gives reactions from two different standpoints. Some of these clubs have an elaborate formal organization with an imposing roster of officers; in others any formal organization is taboo. For best results, the simplest form of organization is to be recommended. Peoria, Illinois, has a very successful form of organization; three members of a program committee are elected. No. 1 has for his duties the planning of the program and presiding for one semester. No. 2 acts as secretary-treasurer. No. 3 arranges for the meeting place and makes all arrangements for the dinner. At the last meeting of the semester the club elects one member to take the place of No. 3 who with No. 2 is promoted. A more complete description of this club may be found in the September, 1933, number of the *Industrial Education Magazine*.

The manual-arts teachers' club is one of the most valuable activities for teachers of industrial arts. These clubs can arrange meetings with various civic groups, such as the Rotary, Kiwanis, and Lions clubs, and in this way interest people who rarely have time to visit schools.

Leaders in local industries can be invited to address the clubs giving their reaction to this part of the work of the school. Occasionally, too, a ladies' night should be planned with an appropriate program.

These manual-arts clubs are of the greatest help to the supervisor in creating an atmosphere of comradeship, and in offering opportunities of contact as man to man rather than of supervisor to teacher. In looking over the minutes

*Those interested may write P. L. Cressman, Department of Education, Harrisburg, Pa., for copies of a program.

of our club which celebrated its 25th anniversary on February 3, 1936, one is impressed by the variety of programs and the large number of business men and educators who have addressed the club. The demonstrations recorded and the projects submitted illustrate the progress that the industrial arts have made in the past 25 years. Teachers should also become interested in state and national associations, all of which may properly be called extracurricular activities.

Some quotations of remarks made by distinguished educators at various times either in their writings or addresses, follow:

John Dewey: "Boys and girls need to be instructed so that they can discriminate between the enjoyments that enrich and enlarge their lives and those which degrade and dissipate."

Robert E. Park: "The improvident use of leisure represents the greatest waste in our American life today."

Glenn Frank: "If I find people helpless in the face of an idle hour I would know that the inner sources of their power were running dry."

William F. Russell: "The education for leisure is no incidental task; it is rather a fundamental problem, and as such, should receive major consideration."

Franklin Bobbitt: "The curriculum of public education does not yet show any trend towards consciously preparing for healthful and beneficent use of spare time."

George B. Cutten: "The proper use of leisure has created every civilization which has ever existed, the improper use has killed each one in turn."

Nicholas Murray Butler: "Guidance in the right use of leisure is vastly more important than what is now called *vocational guidance.*"

Henry Suzzalo: "Could we solve the problem of leisure we should surely have the beginnings of a new kind of world, a more effective and happy one."

Some of the things achieved by extracurricular activities:

1. They develop resources within the individual for self-entertainment and self-expression.
2. Boys learn to appreciate the training and skill required of the craftsman and mechanic.
3. Offer opportunities for trying out abilities along mechanical lines.
4. Give the boy confidence in his ability to do things.
5. Train boys to use their free hours in creative work, instead of being passively entertained by commercialized amusements.
6. Offer an outlet for energies which might otherwise be spent in activities leading to trouble.
7. Develop enthusiasm for craftwork, which will be valuable as a leisure-time activity in adult life.
8. Make boys less dependent on others for services which they learn to do for themselves.
9. Develop resourcefulness and constructive thinking.
10. Develop in a boy the ability to think his way successfully through difficulties.
11. Offer an incentive for looking up information.
12. Strengthen the home life by making the home the center of activities.
13. Offer an opportunity to use tools and materials in constructive ways.
14. Bring an enrichment of experience and arouse learning interests.

Industrial Arts in Teacher Colleges

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A comparative study submitted in 1933 in partial fulfillment of the requirements of the master's degree. Forty-two institutions were surveyed.

In this study an effort was made to determine something of the staff, equipment, and curricula of industrial-arts departments in a number of teachers' colleges. The purpose was not to attempt to set up an ideal program of industrial-arts teacher training but to make a comparative study of some aspects of that work as it is now carried on. The material upon which the investigation was based was gathered principally from a questionnaire. Heads of industrial-arts departments of the 113 class "A" institutions (the number at that time) in the American Association of Teachers' Colleges were asked to co-operate, and

Table I. BUILDINGS AND EQUIPMENT

Value of buildings	Total value of equipment	Distribution of Equipment Values													
		Woodwork	General shop	Drawing	Machine shop	Electrical shop	Sheet metal	Farm mechanics	Auto mechanics	Printing	Crafts	Miscellaneous	Concrete	Finish	Forge
	2710	2500	110	100											
	2300	2000		100							200				
	2580	1490		350		200	530	10							
	3000	2000	100	800							100				
10000	4800	3000	600	600		200	250	150							
	8500	2000		1500						1500	2000	1500			
	7100	3000	1500	800	2500								300		
40000	6025	4500	950	575											
	6000	3000	1000	1500			500								
25000	5175	3000		300	1200	75	600								
	5900	3600		800	800	200	300		200						
10000	5275	2700	450	375	325	175	150			1100					
60000	9800	4000	1500	200	2500		100			1500					
	4200	3000	300	700		100		100							
20000	8800	6000	1600	1200											
	6550	4200	1000	800		50	500								
6500	5440	4900		290			250								
	5000	2000		175	300		200			2325					
	8800	5000	1000	1000	1300										
50000	12000	3000	500	1000	4000				1000	2500					
25000	11700	9000	1000	700					1000						
	10800	3000	1800	250					2250	3500					
40000	14000	4000	3000	1500	5000							300	100	100	
	21900	3500	700	500	1800				200	7000		8200			
	7800	6000		1800											
	12300	6000	500	1000		100		200	500	4000					
40000	16000	7000	3000	2000	3000		1000								
	13400	4500		450		3850	2300				1800				
	20000	6000		2000	6000	1000	1000			4000					
10000	15750	10000		400		250			100	5000					
70000	20000	12000		2500	400	100	250	250	500	3500		500			
40000	26075	4850	600	700	11500	800	1500		3000	2400	75		100		500
	26500	10000		2500	7000	1000	3000			3000					
20000	30050	5000		750	17500	200	300	1500	800						4000
75000	35393	8636		1435	4579		1897		1618	16580	192			546	
140000	40000	11000		1500	10000	500	2500		1000	11000		1800		300	400
	41050	16000	1000	2500	14000			800	750	6000					
200000	38800	5000	1000	1800	10000	3000	1000			7000					10000
200000	70092	12746	1500	2649	12236	500	696			35000				199	4546
100000	72000	30000	10000	500						30000	1500				
200000	75000	26000	2500	500	12000	5000	1500		7500	20000					
	100000	12500	2500	1000	65000	1500	2000	1000	7000						2000

questionnaires were sent to those who signified their willingness to do so. Among the questionnaires returned, a few for various reasons were not usable. The 42 schools which finally were represented in the study are distributed over 22 states.

Table I gives rather complete data as reported in the questionnaire concerning the number and approximate value of industrial-arts buildings, and the relative frequency of, and approximate value of equipment for each type of shopwork offered. Each horizontal line represents the estimated value of buildings and equipment in one school. It will be noted that all schools studied were equipped for woodwork and drawing. However, it was found that 39 schools were equipped to offer additional types of work; the average number of types of equipment reported in the 42 schools being above 5 and under 6.

The figures here given, of course, imply more than the amount of money invested in housing and equipment. To some extent they indicate working conditions, local demand for the work, and the rating and encouragement received from teachers' college administrators.

There were 135 instructors in the 42 departments studied. As to educational qualifications, it was found that among this number, 1 had the degree of doctor of philosophy, 51 had master's degrees, 54 had bachelor's degrees, and 29 had college training but held no degree. Among the heads of the departments, there were 23 with the master's degree, 18 with the bachelor's, and 1 holding no degree. To anyone who has observed the growth and development of this phase of education over a number of years, it is apparent from these figures that industrial-arts teachers are coming to realize the value of having professional ranking as high as the staff members of other departments.

There was a wide range of difference in departmental enrollment and in the number of teachers employed. The smallest department had 16 students, the largest, 225. While 9 schools had only 1 teacher, there was 1 school which employed 16. There were almost 3,000 students enrolled in the 42 departments investigated. What courses were available? What technical, professional, and academic subjects were required of those specializing in this work?

An extensive list of technical or content courses was offered in the 42 schools. Ample evidence is shown in Table II of the traditional practice and demand for woodwork and drawing. However, the wide range of technical courses seems to emphasize the advisability of prospective teachers learning to work with a variety of tools, machines, and materials. These unit courses were usually scheduled during the first 3 years, with the exception of shop maintenance, planning, and equipment construction which were ordinarily placed in the fourth year.

If a candidate for the bachelor's degree had received training in a trade school, how much of this work was accepted in lieu of college industrial-arts training? It was found that 15 of the schools did not recognize any of the trade-school work. Several replied that some recognition was given but did not say how much. Fourteen schools gave examinations over the work paralleling their college courses and allowed credit ranging from 4 to 19 hours. In 2 schools approximately full credit was given for the same type of work, while in 2 others the student was excused from the trade

Table II. TECHNICAL OFFERINGS AND REQUIREMENTS

Subjects	No. of schools requiring subjects in				No. of schools offering subj. as a dept. elect. in				Total No. of schools offering subject	Total No. of schools requiring subject	Average No. of hours required	Range
	First year	Second year	Third year	Fourth year	First year	Second year	Third year	Fourth year				
Bench woodwork	33	3							35	35	4½	3-9
Wood turning	6	9	3	2		6	4	1	27	19	3½	1-4.6
Elem. cabinetwork	15	17	7		1	4	3		38	38	6	3-12
Carpentry	1	5	2	1	1	6	2		15	9	3½	3-6
Adv. turning and cab.mkg.		2	8	4		1	8	3	20	14	6	4-12
Patternmaking	1	1	3		3	6	2		12	5	4	3-6
Millwork		1	3				3	1	7	4	4	3-12
Wood finishing	1	2	6		2	1	6		15	8	3½	1.5-4.5
Upholstering	1	1			1		4	2	8	2	3	1.5-4
Wood Technology	1					1	2		4	1	3	3
General metal	3	4	2		2	4	1		13	8	3½	3-9
Art metal					1	3	2		5	0	0	3-8
Sheet metal		5	6	2	1	2	5	1	20	13	3½	1.5-9
Machine shop	4	5	6	1	1	2	4	1	14	10	5½	3-18
Auto mechanics	1	5	2	3	1	4	6	3	17	11	4	3-33
Foundry	1	2	2	1		1	1	1	6	4	4	4-10
Forging	1	2	3		1	1	1	3	9	4	7	3-9
General shop	9	12	2	1	2	2	1		22	19	7	1.5-24
Electricity	5	4	3	3		2	3	1	18	14	4	3-8
Farm shop		1	1		1		3	1	6	2	4	3-12
Printing design					1	1	1		1	0	0	1.2
Printing	3	5	1		3	7	7	5	17	6	8	3-40
Bookbinding						1	2	1	3	0	0	4-12
Linotype					1	1	1		1	0	0	5.4
History of bookbinding								1	1	0	0	4
Leather							1		1	0	0	4
Concrete	1	1		1		2	4		9	3	3	1.5-4
Fiber-furniture constr.	1					3	3		7	1	3	3-7.5
Shop maintenance	1	1	1	5	1	1	1		11	8	3	2-4
Ind. arts for elem. grades	1	1	1		3	9	2		14	3	3	2-8
Mechanical drawing	3.9	6	2		1	2	2		42	42	6½	3-12
Projection drawing	1	3			2	5		1	9	4	3	2-6
Architectural drawing	1	6	12	7	2	5	13	4	36	25	5	3-12
Machine drawing	1	3	5	6		4	13	4	28	14	3½	3-9
Industrial-arts design	6	11	3		1	2	3	2	25	19	3½	2-9
Descriptive geometry		1	1		2	2	2		7	2	3½	2-9
House planning			1			2	2	1	6	1	3	2-4
Orders of architecture								2	2	0	0	2-3
Topographical drawing								1	1	0	0	3
Industrial photography							1		1	0	0	4
Radio							2	1	3	0	0	2-4
Modern industries		1						1	2	1	3	3-4
Ornamental iron							1		1	0	0	2
Plumbing									1	1	3	3
Shop safety and hygiene	2								2	2	3	3
Tractors								1	1	0	0	3
Pumps and irrigation eqt.								1	1	0	0	2
Clay									1	0	0	4
Toy construction						1			1	0	0	4
Pottery							1		1	0	0	4
Equipment construction								2	2	0	0	4
Wood carving							1		1	0	0	2
Airplane							1		1	0	0	2

Table III
TECHNICAL REQUIREMENTS IN 42 SCHOOLS

Total number of term hours of departmental required subjects	Total number of term hours to be selected from departmental electives	Total number of hours of technical work required for graduation	Total number of term hours of departmental required subjects	Total number of term hours to be selected from departmental electives	Total number of hours of technical work required for graduation
20	16	36		56	56
36	9	45	45		45
24	12	36	52		52
36	29	65	36	12	48
45	3	48	20	24	44
36	20	56	32	16	48
34		34	45		45
40	20	60	53	7	60
72		72	40	20	60
36	14	50	40		40
48	20	68	36	6	42
95		95	36		36
	45	45	42		42
	72	72	32	16	48
32	13	45	40		40
16	45	61	36		36
30	15	45	60		60
	52	52	36	12	48
40	8	48	30	23	53
36	18	54	40	28	68
30	18	48	36		36

activity with the provision that he take other work instead.

It was found that only a few mentioned trade experience as prerequisite for a degree. One school required 34 weeks actual trade experience, while others recommended summer vacation periods to be spent in the industries.

Table III was designed to show the number of hours in content subjects that each school required for graduation. The range in departmental requirements was from 36 to 95 term hours, with a mean average of 51.

Table IV
ACADEMIC REQUIREMENTS

Subject	Number of schools requiring the subject in				Total number of schools requiring the subject	Mean average number of term hours required
	First year	Second year	Third year	Fourth year		
English	42	17	10	4	42	9
History	8	10	2	1	17	7
Social science	4	7	9	3	19	5
Physics	4	8	3		15	9
Chemistry	1	3	2		5	8
Biological science	10	4			12	7
Mathematics	8	9	3		20	9
Applied mathematics	4	1	1	1	7	3
Art	10	6	1		16	4
Music	2	3	2		7	2
Geography	1	4			5	3
Languages			2		2	13
Physical education	34	28	20	14	34	6
Groups not specified	1	1			1	30
Groups not specified	1	1	1		1	36

Table VI
DISTRIBUTION OF CREDITS REQUIRED FOR GRADUATION IN 42 SCHOOLS

Technical	Academic	Professional	Free electives	Total	Technical	Academic	Professional	Free electives	Total
42	60	40	44	180	56	57	49	18	180
48	36	40	56	180	45	48	36	51	180
45	45	30	60	180	52	64	26	38	180
66	82	42	0	190	48	48	42	42	180
48	41	28	53	180	44	48	37	51	180
40	50	49	41	180	44	50	19	67	180
34	51	33	62	180	45	39	42	54	180
60	60	36	24	180	60	58	32	30	180
72	68	44	0	184	60	55	31	34	180
50	23	38	69	180	46	46	36	52	180
76	70	34	0	180	52	50	45	33	180
68	44	39	29	180	36	68	32	44	180
95	39	41	5	190	42	15	37	86	180
45	48	31	56	180	48	50	44	38	180
72	30	41	37	180	40	53	32	55	180
45	80	34	21	180	36	48	45	61	180
56	36	40	48	180	36	48	29	67	180
45	48	32	55	180	60	66	54	0	180
52	50	35	43	180	44	40	34	62	180
48	50	34	48	180	55	70	33	22	180
52	50	31	47	180	51	51	36.5	41	180.5
48	66	27	39	180	Average				

Table V. PROFESSIONAL REQUIREMENTS

Subjects	No. of schools requiring subjects				Elective ind.arts. prof. courses offered				Total No. of schools requiring subjects	Range	Average No. of hours required
	First year	Second year	Third year	Fourth year	First year	Second year	Third year	Fourth year			
Psychology	23	10							33	15-8	4.25
Educational psychology	10	15	8	2					35	2-6	4.1
Adolescence psychology		5	3						8	3-6	3.6
Child psychology	1	2							3	3-4	3.6
Principles of education	11	4							15	1.5-6	3.5
Technique of teaching	4	8	11	2					25	3-8	4
Principles of secondary educ.		4	8	8					20	3-8	3.75
Principles of junior high		4	1	3					8	2-5	3.35
Tests and measurements	1	2	9	9					21	2-5	3.52
History of education	2	2	5	4					13	2-4	3.5
Curriculum construction		2	1	2					5	3	3
School management	2	5	2	1					10	1-4.5	3.2
Practice teaching				42					42	4-16	8.5
Special methods		9	16	14					39	3-7.5	3.8
History of indus. educ.	3		6	7			2	1	18	2-4	3.5
Vocational education		2	6	1	2	3	1		9	2-5	3.6
Trade analysis			2				3		2	2-4.5	3.25
Principles of guidance			4	4			3	4	8	2-5	4
Indus. arts curric. const.		1	1	3			1		4	2-4.5	4
The general shop		2	2				1		4	3-4	3.25
Admin. and supv. of gen. shop				6			3		6	3-6	5
Organization of indus. arts		1	5	3			1		9	1-5	3.6
Shop management				4			2		4	1-4	2.25

What of the so-called academic requirements of industrial-arts majors? All the 42 schools studied agreed that at least 1 year of English was essential. (See Table IV.) And although more than five-sevenths required some work in the social studies, education and the sciences, no agreement was reached as to what subjects and amount of time spent in these fields should be included in the industrial-arts teacher's preparation. Mathematics was included in 23 curricula and in 16 art was considered essential. Five schools required geography and 7, music. Only 2 schools required foreign language.

The average number of elective hours was 51. There was a great diversity of opinion on this point, however. Four schools had no free electives, 1 had only 5 hours, and 1 allowed its industrial-arts majors 86 free elective hours. (See Table VI.) Such courses were often used to satisfy the requirements for a minor.

The following data on the subject of minors, while a little difficult to arrange, is believed by the writer to be of sufficient interest, if not of importance, to be included in this report.

Thirty-seven schools studied were specific enough upon this point to permit of classification. It was found that 6 schools required no minor for a bachelor's degree. In 21 schools the student was permitted to choose his own minor subject or subjects, with 5 of this number recommending that their major students select certain fields as follows:

1. Science, mathematics or history.
2. Mathematics, science, agriculture, or English.
3. Mathematics, science, or the social studies.
4. Physics or mathematics.
5. Any minor *excepting* music, athletics, or religious education.

Ten others were more specific *requiring* that minors be selected as follows:

1. Two minors of 24 hours each; history, physics, mathematics, language or English.
2. Twenty-seven hours; physical science, English, history, or physical education.
3. Two minors of 21 hours each; physical science and mathematics.
4. Twenty-nine hours; mathematics or physical science.
5. Twenty-four hours; science, mathematics, history, English or languages.
6. Twenty-seven hours; English, social science, physical education, or art.
7. Thirty hours; social science, physical education, agriculture, or English.
8. Twenty-two and one-half hours; fine and applied arts or physics.
9. Twenty-four hours; social science, general science, history, English or mathematics.
10. Eighteen hours; mechanical drawing and drafting.

Table V shows the general nature and extent of the professional course offerings and requirements. With the exception of psychology and introduction to education, there was a tendency to schedule these courses in the second, third and fourth years. Slightly greater emphasis was placed on psychology than on any other subject in this group. Beyond this the emphasis was scattered. It was generally agreed that these courses should be taught by the industrial-arts staff, the credit to be counted as education.

Each of the departments studied had some arrangement for observation and practice teaching. Twenty-seven required that all practice teaching be done in

(Continued on page 184)

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

The Youth Movement

This country is at last making a seemingly serious attempt to set up some kind of policy with regard to the country's out-of-school and out-of-work youth. Committees in the various cities are working on the problem. Quite a number of communities have taken a census in order to get actual facts as to the number of young people who are in need of work or further educational opportunity.

This is attacking the work in the right way. Just guessing at the needs, as has been done in the past, is not a safe basis for setting up policies. Many communities, however, have already a fairly definite idea of their problem without going into extensive research work. In cases of this kind, it is better that time be spent on a formulation of plans devised to bring together these young people and the opportunities that are already in existence. In every fair-sized city there are many more recreational and educational opportunities conducted under public and private auspices than the average citizen recognizes. Making known to the young what they can do to develop themselves, is a step that can well be made without entering into much time-robbing preliminary work. A good example of this type of work is the directory of part-time educational and recreational opportunities in Milwaukee County which has just been issued by the Mayor's Youth Committee of One Hundred.

A directory of this kind, however, will not solve the youth problem, if it is not coupled with guidance. Youth, self-sufficient as it may feel, needs a great deal of guidance — vocational, educational, recreational, health, social, and the like. In the absence of a specifically appointed group to take care of this necessary guidance work, there is no better qualified body of workers to take care of this work than the school teachers. This is especially true of the shop teachers, be they in the grade school, or in the junior, or senior high school.

Many of these teachers have had experience in extracurricular activities, and know how to conduct clubwork, take care of athletic events, games, and the like. They also know how to gather and transmit vocational and educational information. They are acquainted with existing school facilities which may be used for furthering the work incident to the carrying on of a successful youth program. More than that, they are acquainted with the very persons who are to profit by the youth movement.

With a real program of vocational, educational, recreational, and social guidance worked out in our schools for the youth of our land, the schools would extend their influence for the betterment of mankind still further. Besides this, it would make our school plants much more valuable, because they would then be in use more hours per day and more months per year, doing that for which the school is really designed.

Time to Close Shop

Another school year is about to close. Many shop teachers are looking forward to a continuation of their work at the same school where they taught during the year just past. Others are contemplating a change in position, and already have new positions, or are looking about for one for next year.

Those who are teaching now, whether they are going to return to the school where they are now located or not, are confronted in most cases with the task of closing up shop for the summer months. Equipment has to be checked over for probable repairs or replacement, bright metal parts have to be protected against the corrosive effects of the atmosphere, small tools, materials, and supplies must be stored where they are safe against depredations, rust, and the like. Arrangements have to be made, if necessary, to have alterations, renovations, repairs, and additions made during the vacation period. This may even mean that the shop teacher will have to plan his vacation in such a way that time will be found to supervise work that must be done in his shop during the summer. A little time spent on this planning now may make the interference with the teacher's own vacation plans a little easier to bear.

Then, there are other details that may not be overlooked. For instance, keys for lockers, toolrooms, and classrooms must be turned over to the proper person. It is well to prepare a list of articles contained in the rooms or places controlled by the keys so that these, too, may be filed with the keys. This will eliminate controversies that might later arise about thefts and losses that occur during the summer months.

Another item, not to be overlooked, is to leave a forwarding address for the summer months. This frequently is forgotten and may entail embarrassing, if not serious, consequences. While taking care of forwarding addresses, at the school, shop teachers should not forget to furnish the same information to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION so that the magazine may reach them regularly during the summer months.

The teachers who are closing shop for the last time in preparation of teaching at another school next year, should be doubly careful to arrange itemized lists for cabinets, lockers, and rooms, in order to register definitely what stores they are leaving, and for the guidance of the successor who, without this information would have many extra worries and troubles.

Looking Around

Clement J. Freund

Dean, University of Detroit,
Detroit, Michigan

From a commencement address given to the graduates of the evening technical course of the Milwaukee Vocational School, June, 1934.

"Looking around" seems a strange subject for an address and yet it is necessary for every one of us to look around continually if we want to keep abreast of the things happening about us. During the world war, an American lieutenant of infantry had charge of a section of trench, where there was something going on every minute of the time. The Germans were dug in about 70 yards away and he and they gave each other no peace whatever. The German artillery bombarded his position every day and often followed the bombardment by a fierce raid. And if he did not have to repel a raid, he at least had to repair his parapets and dugouts. Every week or so he went over the top with his men and when he gained ground the Germans were likely to push him back again a day or two later. And between times he had to care for his wounded and remove or bury the dead. And, of course, he had to get up food and ammunition and make desperate efforts to keep up the morale of his men.

After many months of this sort of thing, he was finally granted a five-day leave in Paris. The first thing he did when he got to the city was to buy a copy of the Paris edition of the Chicago *Tribune* to read how the war was getting on. He had been so busy with his immediate, daily problems that he had neither the time nor the opportunity to study the larger movements of the war. He wanted to know whether the Allies or the Germans were gaining the advantage, whether there were any important changes of front, what major offensives were under way, and what the people at home thought about it all.

Most of us are like that lieutenant. We are so busy with our everyday tasks and difficulties that we can hardly pause to look about, yet it is well that we should make such pauses now and then, especially at such times as this, your graduation day. Looking back about 10 years, we see eight or nine earnest men in a private dining room of the old City Club in the Merrill Theater Building. They are the personnel men of important metal trades and public service industries. Dr. Rowland is there, and Dr. Scrimshaw and Mr. Day and others whom most of you do not remember or never knew. They have planned an evening course in technical and engineering subjects for promising men in their respective organizations who have been denied the opportunity for higher education of the ordinary type. The course has been laid out and the question arises, where will it be given?

One of the group suggests that they go to see Mr. Cooley of the Milwaukee Vocational School. "He will understand what we are talking about and will give us at least a sympathetic hearing." The scene changes to Mr. Cooley's office. A spokesman for the group explains their purpose. Mr. Cooley perceives that the plan has merit, that it comes within the proper scope of vocational education. He adopts the plan and promises his wholehearted support, and the work gets under way. About a hundred students were expected: five hundred came. But most of them did not understand the purpose of the course. They thought that they could become competent professional engineers after a few months of not-too-difficult evening-school work. The majority were quickly eliminated or eliminated themselves. Ten of the original class finally graduated.

Progress was slow during the first four or five years, and often discouraging. People wondered if the whole undertaking was worth while and some half expected Mr. Cooley to discontinue the course. But he never did, nor even suggested it, and after five or six years, there came a spurt in interest and activity and the little experiment grew into the impressive institution which you have today, a solid pioneer in the field of technical institutes, a field which may grow more rapidly in the next twenty years than any other branch of technical education.

Looking about some more, we see that science and research are rapidly becoming more and more important in industry and in engineering. Of course, I am not talking about the research fad of the moment. Just now everybody talks and writes eagerly about research. Youthful graduate students, lecturers, advertising men, grow enthusiastic over research projects. Many of them do not know what it is all about. Dr. Munroe, of the California Institute of Technology, has paid his respects to unsound research work. He calls it "the art of taking things out of old books which nobody has ever read, and putting them into new books which nobody is ever going to read."

That is not the kind of research I mean. I mean a modest seeking for undiscovered truths in the realm of the physical sciences, by mature, fully qualified men whose principal aim is the expansion of knowledge, not the acquisition of the doctor's degree; who probably earned the doctorate so long ago that they can hardly remember it. This kind of research ago the manufacturer of leather, or gas engines, or textiles exerts a great and a growing influence in industry. Ten years may have submitted a difficult problem to a university department once a year. Today faculty members of the University of Detroit, and of many other universities, are retained by manufacturers on an annual basis to keep them informed of the current progress in scientific research, and to tell them how they may develop the results in their business.

More significant still, many corporations, particularly the larger ones, such as the General Electric Company, the American Telephone and Telegraph Company, the General Motors Corporation and others, maintain extensive research laboratories of their own and the directors of those laboratories are not the professors of the comic supplement, but usually officers and directors of their corporations.

Yes, research has often been fumbled, and huge funds for research have disappeared without results, and pretentious beginnings have dwindled into nothing, but similar blunders have been made in business, in government, in every branch of human activity. You cannot stop the progress of science. Look what research has done for the long-distance telephone, to mention only one example. Fifteen years ago you put in a call for your brother in Pittsburgh, let us say. The operator told you she would call you. She did call you ten minutes or two and a half hours later, and you paid for the connection

and the time you held up the wire. In fact, time was about all you could pay for because there was sure to be more scratching and buzzing on the wire than conversation. Today the operator reaches your Pittsburgh brother in less time than it takes to hang up the receiver and you hear him as well as if he lived across the street. Scientific research has made the difference, not accidental invention, but a deliberate attempt to find the facts of science which could improve the service.

Please don't mistake me. I do not for a moment suggest that graduates and students of this technical course should go into research work. The technical course does not train research workers and was never intended to. But you should take science seriously. Never pooh-pooh real research. Engineers often make fun of the scientist. They boast that they get a job done long before he can get out his test tubes and his galvanometers to determine how the job should be done. They call him a theorist. But looking around we can see the theorist coming into his own. The big, fat, practical man who laughs at science was something of a national hero ten years ago. Today he is a ridiculous figure. Ten years hence he will be a museum specimen, together with the hansom-cab driver and the tintype photographer. Perhaps you cannot always understand what the research man is doing. But try to understand; and by all means do what he tells you to do.

Looking about some more, it becomes evident that there are great engineering opportunities which have been almost completely neglected. There is need for technical men who can interpret science to industry. The typical research man in the university and in industry is an individualist who works best when alone. He seldom possesses the gift of teamwork. He thinks that a project is complete when he has prepared and submitted a report. On the other hand, the practical industrial manager or operator is ordinarily a man of long experience but who has few scholarly accomplishments. He may respect science but he carefully files away the reports of the research man, and leaves them filed if possible. He is afraid that he may become too deeply entangled in something he does not understand. As a result, research and operation seldom get together, except in a few large and important corporations. They are like two powerful draft horses hitched to opposite ends of the wagon instead of pulling together as a team.

You graduates of the evening technical course are, I think, well equipped to bring research and operations together. You know the practical side of industry, and at the same time, you know something of science, and you can feel reasonably at home in both environments.

Of course, do not try to get a position as "research coordinator." Employers will not know what you are talking about if you use that term. It is not necessary to get a new office created for yourself. Research and operations can be brought together in almost any industrial position. A young engineer began work two years ago in a plant manufacturing metal parts for automobiles. In this plant there was a department for metallurgical research but few research results were applied in the shop. After about a year the young engineer became foreman in a production department. He cultivated the metallurgists, learned what they were doing, and made use of the results of their work in his department whenever he could. Almost immediately his scrap and his costs went down, and the quality of his product went up. Not long ago the manager of the plant made him assistant superintendent so that he could gain, throughout the plant, the advantages he had secured in his own department. The manager doesn't know that this young man has been co-ordinating research and operations, the young man hardly knows it himself; all he knows is that it is sensible to apply out in the shop what is learned in the laboratory. Some of you, many of you, might do well to try to emulate his example.

Looking about some more, we may see something which, like the movement of a glacier, is positive although hardly perceptible. This is the shifting of engineers from technical to industrial work, from design, checking, testing, to the management of shops and shop departments. There are a number of good reasons for this trend. For one thing, there is a surplus of engineers for technical work, at least at the moment. Besides, the expert technicians who came out of the equipment-manufacturing industries to run the mass-production plants, are rapidly disappearing, as all generations disappear.

In February or March I spoke to an official in the automotive industry about this year's engineering graduates. He said to me, "What we need most now is young college men to go out into our shops and learn all about them. There are enough technical engineers for some time to come."

Not long ago a tool manufacturer wrote for "recent graduates in engineering to go out into the shop and stay there. And when we say 'stay there' we mean just that. We do not want them to go into the shop for a year or two in order to learn the practical side of the business in preparation for experimental or sales work; we want them to make the shop their business, their lifework."

Earnings are as good an indication of this trend into industrial work as any other. Those men earn most who are most in demand, other things being equal. According to the Committee on the Economic Status of the Engineer, earnings in the industrial branch of engineering are about one thousand dollars per year higher than the average in the profession.

I mention this because I suspect that some of the graduates, who have had long shop experience and who know the shop well, may have fixed their gaze impatiently on the drafting room. In fact, they may have undertaken this technical course with the definite purpose in mind of getting into the drafting room. I should advise otherwise. Why change from a field of work with which you are familiar and which is comparatively open, to a crowded field of which you know nothing? Why not use your new knowledge to improve and secure your shop position?

Let me discuss one more item. Most of you have seen violent chemical reactions. Pick up a test tube containing a solution of sodium bicarbonate, for instance. Add a few cubic centimeters of sulphuric acid. The liquid boils turbulently and fumes rise, and for a moment you fear that the tube may burst or overflow. But gradually the disturbance subsides, the bubbles become sluggish and finally there remains only a clear, placid solution.

The development of our national industrial life may be compared to the development of that chemical reaction. We have passed through the turbulent stage. Eagerly we expanded and pushed ahead; we abandoned one enterprise to launch into another; we built and tore down and built again. I wonder if we are not about to enter into a more restful period, a period in which we shall substitute refinement for mere growth in volume; we shall become more careful and conservative, more like the Danes or French or Swiss.

Careers, too, will undoubtedly change with the times. The smart business man of the past was the plunger who doubled

and quadrupled hundreds of thousands of dollars into millions and more millions; the smart business man of the future will be the preserver who succeeds in maintaining his enterprise intact through the years. Similarly, the smart young man of the past advanced or changed rapidly from each good job to a better one; the smart young man of the future will manage to remain employed in very bad times as well as in good.

Last year a young sales engineer of Detroit learned, painfully, that a new order is at hand. He heard of a good position at Philadelphia. It looked like something better than he had, so he boarded a fancy train for Philadelphia and put up pretentiously at the Bellevue-Stratford Hotel, and arranged an interview to discuss the job. The interview was delightful. Several dollars worth of excellent food was consumed and the young man felt that he had made a good impression, which he undoubtedly had because he is the kind who does. No definite arrangements were made but he confidently expected to be called before long to take over the new position. Weeks passed but he had no word. Then, one day, he received a letter. But this letter came from his own sales manager at home. The letter told how the corporation appreciated his very good work but that necessary economies made it impossible to retain his services after a month from that date. The next day a letter came from Philadelphia explaining that he could not be engaged because of business conditions but that he would be kept in mind should business pick up. Very probably this young engineer had devoted too much time and thought to exploring for openings and too little to his job.

I do not mean that you should not strive for promotion and advancement; you should by all means. But first study your job thoroughly, if you have one, until you know all about it; until you know more about it than anyone else could learn in a year; until you know the job intimately in its relation to your fellow, your superiors, and your subordinates; until you have carefully estimated what would happen to the job, and to you, in case of important readjustments in the business; until you feel reasonably certain that you can hold the job through the next depression, if your employer survives it; then and only then should you think about promotion.

In looking about me I have seen other men of experience and determination, like you, who have pushed and fought their way up from the bottom and have educated themselves in spite of severe handicaps. And what I have seen makes it seem necessary to issue a warning. These men prize their education very highly and justly so, but they are likely to expect too much of their education. They are prone to think that if they wave their diploma three times in the air, they will have advancement, distinction, riches, with no further effort on their part. They forget that a good education is only one of many essential and desirable qualifications. In this gathering I need not talk about honesty and reliability and hard work and all that sort of thing. But I should like to mention careful manners, and deportment, and tact. Particularly, do not antagonize or irritate the boss, the man who signs your pay check. You may not like his way of designing a bearing or installing a furnace, you may know a lot more about bearings or furnaces than he does, but if you have failed once or twice to show him he is wrong, don't make a nuisance of yourself. If you cannot stand it, start your own business and do it your way, but as long as he remains your boss, do it his way. He is the boss, and getting things done his way is one of his prerogatives.

Finally, I must congratulate you young men who graduate this evening. You should be congratulated because you have successfully completed a hard course of studies extending over a period of five years. However, I wish to congratulate you particularly because you have gone after education for its own sake. There is no field of activity that I know of in which forms and symbols so readily take the place of substance as in education. Students in conventional schools and courses, too frequently seek grades, credits and degrees, instead of information and cultivation of the mind. But the evening technical course is unadorned education, without pomp and glitter; and those who pursue the evening technical course can desire only education, for nothing else is to be had. You have followed this ideal, you have done well.

In your happiness tonight do not forget the heavy debt of gratitude which you owe to the officials of the Milwaukee Vocational School. They have had faith in you, and because of this faith they have given to you a measure of thought and care and attention exceeding by far the measure to which you were entitled as students of the school. And this debt can best be repaid by living and working in such a way that you will always be a credit to the school and to the evening technical course.

And now, permit me to wish each and every one of you, graduates, not merely success but what is more important, deep and lasting happiness.

Industrial Arts in the Smaller School

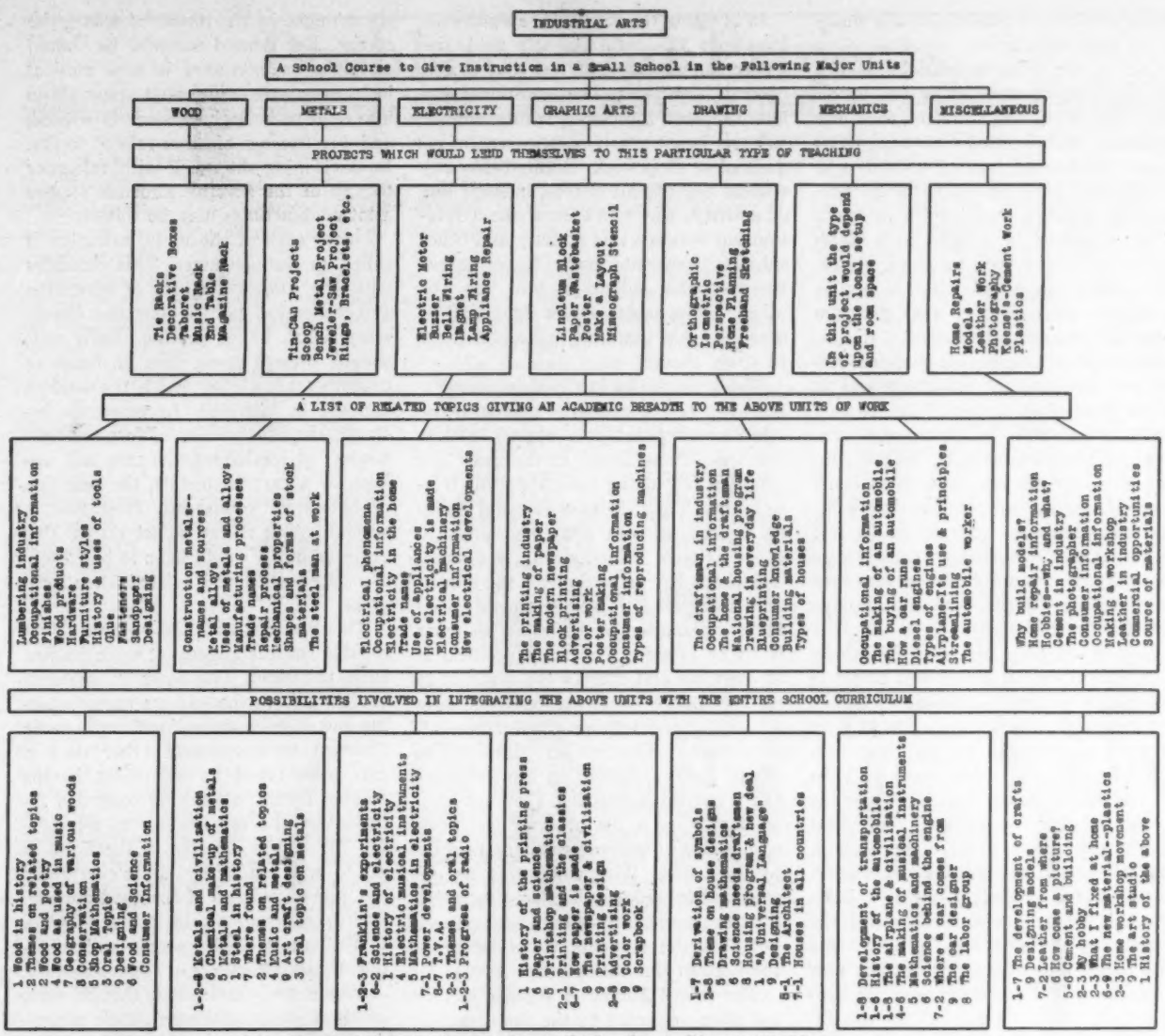
William J. Micheels

District High School,
Shelby, Montana

A few things to be remembered and aimed at by the teacher who must plan the industrial-arts work in the small school.

When industrial arts is able to show the practicability of its content in relation to problems in everyday life, its place in the curriculum will be assured. In other words, when such a course can show an active transfer to real situations rather than merely a passive absorption of procedures and processes, it will be included with little hesitation. It is true that many teachers are already including in their courses material which tends to solidify industrial arts in the school setup, but the process must be expanded, especially in the smaller schools.

In an effort to keep pace with the rapidly changing situations about which we hear and read so much, it is necessary for the small school to branch out from its traditional path and include a rather varied array of subjects. In adopting and adapting an industrial-arts course covering a wide range of experience, the shop teacher in the small school shop must be careful that the price factor will not become a prohibitive one. Schools which include the traditional woodwork or single-activity shop must be made to see the advantages, if not the necessity, of such a



The above numbers refer to subjects showing the possible relationships--
History-1, English-2, Public Speaking-3, Music-4, Mathematics-5, Science-6, Geography-7, Social Science-8, Art or Design-9

change. Those having no shopwork must be sold on the idea, and what is a better argument than that of correlation or integration, with the interest factor playing a most important part?

The course shown in the accompanying chart may not contain everything that might be included, and it most certainly should not be looked upon as a basis for all future work, but it is a step in the direction of applying a wider scope to the subject of industrial arts. Such a setup as is included here will need many changes and improvements; in fact, the writer has several different departures in mind even after having made numerous recopies. The motive has been to present the material to be used in such a manner as conditions permit and warrant. It would be easy to prescribe the ideal setup in which cost and experience are not to be reckoned, but when applying such a course to all schools and conditions it becomes another matter, which explains the conservative nature of some of the units.

This particular layout is for a small school which has little equipment. However, such a stipulation affects only that level having to do with the projects made. The material in the lower levels is applicable to each unit regardless of what the student is working on. One is aware that some phases of various industries are not given the precedence and important part that they probably deserve. Within this list might be included building construction, furniture upholstery, masonry, and any of several other departures connected with the various main units. This is not due to an oversight, but rather because of the staggering nature if everything possible were included. The intention has been to see that such material is taken care of in the levels having to do with related work.

The age group for which the accompanying course is intended is that of the junior-high-school level. By widening the range and depth of the various units it could easily be made to include high-school students. A high-school sophomore might not be keenly interested in making a simple tie rack or a plain orthographic drawing, but he might see things in a different light if it were possible to make an end table or help in the designing of a small house. At the same time the included academic and related material could easily be made to cope with his best efforts. The course charted here is

plastic and can be made to fit any number of local situations.

One of the primary motives behind the outlining of this course has to do with that level which deals with the academic and related material. The rather pronounced leaning toward such a departure, as evidenced by recent professional articles, would seem to make it advantageous to include such material in a small-school program. In return, this opens a wide field of opportunity to dovetail the shop program into the school curriculum.

In an effort to graduate students better prepared to face situations and to adapt themselves to conditions as they really exist, schools must, and are, breaking away from the traditional subject plan. We cannot continue to teach a subject as an independent unit without regard to what goes on in the rest of the school. Many indeed are the false impressions students obtain because they failed to see the practical relationships between the courses.

In the majority of cases we cannot take Johnny out of school and give him practical experience sufficient to enable him to grasp real-life conditions in their true sense. We can do the next best thing, however; set up a structure within the school as similar as is possible under existing conditions. One must continually strive to give the student (or better yet, have him take on his own initiative) his particular series of courses in such a manner that they will be closely related and seen in their true light. From the many departures now in evidence it would seem as if the familiar single-unit classes will in the future become somewhat passé. In their place might appear a laboratory-type room with each student progressing as he is able, and studying subjects, not as individual units, but as they relate to the goal toward which he is striving.

Ours is fundamentally an industrial civilization. In an effort to better fit the school to the needs of the pupils, what is wrong in proposing the industrial activities as a core around which to build the curriculum? Not to influence the student toward a particular industrial occupation, but to allow him to see academic facts in the light of after-school potentialities. Nor would the so-called cultural studies be neglected as one might possibly infer. Their value is not to be belittled, but let us first be careful not to turn out "intellectual morons who know it all, but who cannot hold a job and live happily," as one author has aptly put it.

In bringing the various academic subjects into the industrial-arts field, the writer cannot help but feel that it is a boon to both sides. The traditional disinterestedness associated with academic subjects is not nearly so apparent in industrial or shop work. Granted that any normal boy has an interest in some line of activity, why can't we strike a relationship between this activity and other subjects; correlate them to an extent whereby the individual will see the other studies under a new light, and in a relationship that will make him eager to study them?

The possibilities involved in attempting to integrate industrial arts with the various other subjects appear almost limitless. Those listed in the chart are simply a few of the more apparent relationships. They themselves could easily be broken up into individual units to cover as wide a latitude as is desired. The levels having to do with the related and integrated material should need little explanation with regard to what is to be offered. The main problem is to assemble and classify the material in such a manner as to facilitate the easy access to, and reliable presentation of, such matter. This, at first sight, seems to put quite a burden on the shoulders of the individual teacher. Yet most shop teachers keep a file of drawings, projects, and information pertaining directly to their field. Why could this not be extended to include all related material, filed and made accessible in such a manner that the students could be given the best in the easiest way?

The school library is another facility too often neglected by the shop teacher. Any number of related topics are constantly on file there, but never made use of, probably because the shop teacher himself does know of their existence. By means of the conference method, it is possible to outline a series of themes, talks, references, etc., which would help each department to tie up their work with that of the other. Take poetry as an instance. How many boys making a footstool or a strap-iron fernery will correlate poetry with the medium in which they are working. It might appear silly at first to try to see any connection, but if they were to read one of Carl Sandburg's harsher poems like "Chicago" or "Prayers of Steel," along with a story of the man's life, they might begin to see things in a different light. Or take a student very much interested in music, but having very little taste for shopwork. For him, the designing and making of a music stand might be the means of selling the course. For related material he should certainly be interested in how musical instruments are made, what materials go into their makeup, how music is printed, and any number of other related topics. In developing shopwork with reference to any of the several academic studies a lot of difficulties may be solved.

Under each of the units, attention is called to the consumer. This coincides with the newest theories of education and economics, that the consumer should know what he is getting. Each unit should present some item or items of consumer knowledge which the student can use in later life. In wood, for instance, the construction of furniture and homes; in mechanics, the care and upkeep of a car; in metals, the selection of household equipment. It is true, a special course might be set up for this purpose, but it would have to be closely associated with the related shop program.

This material could be obtained from reliable sources already at work on just such problems. The mass of material available from the various manufacturers and sales organizations could easily be used to supplement other data if care were taken to select that having reliable facts. In teaching consumer information the opportunity of advertising the course directly in the home is not to be taken lightly. As in everything else, the knowledge of the good done by such a program would insure its place in the minds of the people and subsequently in the schools of the community.

Vague and far-fetched though some of these ideas may seem, their acceptance and need by the school of the near future cannot be side-stepped. When we look at the program of the Federal Government to educate adults in the newer forms of living, how much more important is it that we materially revise our present educational policies to take care of the younger generation.

(Continued from page 178)

INDUSTRIAL ARTS IN TEACHER COLLEGES

the major field; the remaining 15 allowing that from one-third to two-thirds be done elsewhere.

The amount of teaching done by the supervisor in the practice school varied from none to 75 per cent. Twenty-seven of the schools reporting on this question showed that the actual teaching done by the supervisor was below the standard of 40 per cent as set up by the American Association of Teachers' Colleges.

Problems and Projects

MACHINE SCREWS

J. K. Olsen, Chicago, Illinois

The following data shows when and where to use the different kinds of machine screws.

There are four generally used types of machine-screw heads, namely: round head, flat head, fillister head, and oval head (see Fig. 1).

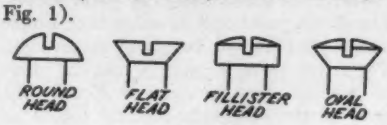


Fig. 1

These heads are standard and can be obtained in common lengths from screw manufacturers. The selection of the screw head depends on the various designing factors.

The Round-Head Screw

The round-head machine screw is generally used where two or more plain parts are to be fastened together, where there are no objections to the projection of the head above the part, and where a hand-operated screw driver can be used.

The round-head screw is favored for its simplicity. The shape of the head is very easily formed in the screw-heading machine. The round-head machine screw is not so good, however, as the fillister-head machine screw where heavy tightening of the screw is necessary. The ends of the screw slot in the round-head machine screw will readily notch under the pressure of the screw driver. This feature is objectionable, not only because it spoils the appearance of the screw head, but also because it leaves a sharp fin which may cause damage.

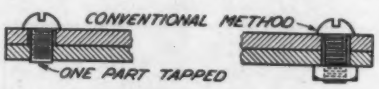


Fig. 2

Figure 2 shows the most common use of machine screws and applies to screws of any shape of head. The first method shown is used where the screw is tapped directly into one part, while there is a clearance hole in the part adjacent to the head. The other combination is with the use of a nut on the opposite side of the head.

The first method shown is favored where the part or casting is not too complicated so as to risk the loss of an expensive part, if, for instance, a tapping should be spoiled. It is much used in design and is in general preferred to the second method.

The second method is mostly used when the lower part is of thin stock or from stock not suitable for tapping. In designing any product, it is necessary to plan the location of machine screws so that the screw driver can be used on them.

Round-head screws cannot be classified as being highly mechanical or pleasing in appearance.

The Most Common Use of Flat-Head Screw

Next to the round-head machine screw, the flat-head machine screw is undoubtedly the most common screw in use.

The reason for the use of the flat-head screw is that the head can be made flush with the surface of the part it clamps or holds in place. See Figure 3.

Flat-head screws are preferred because they can be made from less material than any other type of screw. The main objection to their use is, that it requires the countersinking operation.

Fig. 3

The flat-head screw as well as the oval-head screw possesses a dowel or centering feature because the cone form of head finds its own seat in the countersunk part, but in any designs where flat- or oval-head screws are used, it should be remembered that to obtain a mechanical product, the tapped holes in the lower part and the countersinking of the top part must be accurate if a proper alignment of parts is to be obtained where a series of holes is involved.

Flat-head screws are generally the poorest appearing screws of them all.

The Most Common Use of Fillister-Head Screw

The fillister-head screw, shown in Figure 4, is undoubtedly the best mechanical screw of the four. It has a rugged cylindrical head very suitable for a forceful application of the screw driver, and is the type of head that is desirable for important fastening, especially for leakproof joints such as where gaskets are used. Together with a

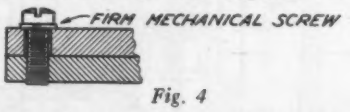


Fig. 4

lock washer, this type of head should always be considered where a good mechanical result is essential.

For mechanical designing and good mechanical appearance, the fillister head is undoubtedly the best of the four kinds.

The Most Common Use of Oval-Head Screw

The oval-head machine screw has all the characteristics of a flat-head screw with the addition of a curved crown on top of the flat portion.

This additional curved portion is mainly for appearance, as the crown gives a dressed-up appearance when used on flush flanges, etc., where the projecting heads of round- or fillister-head screws would be objectionable. See Figure 5.

One feature in flat- and oval-head machine screws, which may be used quite frequently, is that these types of heads permit the metal to be upset into the slot

Fig. 5

after they are screwed down, thus providing a means of preventing the loosening of the screw. Other means to prevent turning are lock- and shakeproof washers. Unscrewing means are sometimes necessary. See Figure 6.

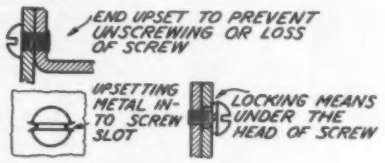


Fig. 6

Miscellaneous Screw Fastenings

There are times when the type of screw is determined by the type of material there is to be held in place. For example, when cloth, fiber, or some other soft material is fastened to a part, it is generally held in place by a washer placed under the screw head as is shown in Figure 7. When the additional bearing surface is only a matter of enlarged surface a plain washer is gen-

Fig. 7

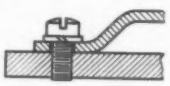


Fig. 8

erally used, but where an additional surface plus security from turning is wanted, this is sometimes taken care of by a lock washer or both a lock washer and a plain washer. See Figures 4 and 8.

The most commonly used material for all machine screws is *steel* or *brass*. There are other materials such as monel metal when a higher grade of material is wanted, or screws may be made of stainless steel where protection against corrosion and strength is desirable, but screws made of these materials are special and cost more than the common machine screws.

When selecting steel or brass screws, remember that the tensile strength of the steel screw is approximately double the

strength of the brass screw, while the shearing strength of steel screws is approximately 1½ times the strength of brass screws. See Figure 9.

When screws and parts are to be disassembled many times, or when parts are subject to exposure that will corrode them easily, it is a known fact that steel and iron will corrode and stick together. It is com-

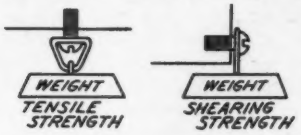


Fig. 9

mon practice, therefore, to make use of different materials such as brass for one part and steel or iron for the other, as these difierent materials have a tendency to keep free and function in spite of the presence of corroding conditions.

Another consideration in selecting steel or brass is sometimes the finishing qualities, as the brass screws will in most cases take a higher finish than steel screws.

The minimum length of thread on screw and depth of tap in part is generally taken the same as the next larger fraction than the diameter of screw. This length is also dependent on a number of other considerations, such as design, material used, and working load. See Figure 10.

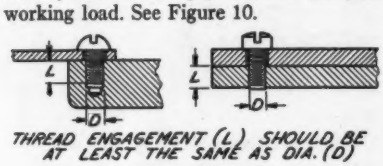


Fig. 10

As far as cost of screws is concerned, the price of round-, flat-, and oval-head screws is practically the same, but the cost of fillister-head screws is slightly more than for the others.

There are other types of screw heads in use such as button head and special small-head screws, but these screws should be used sparingly and preference should be given in all cases to the ordinary standard commercial heads and sizes.

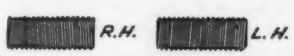


Fig. 11

Figure 11 shows a right-hand thread and a left-hand thread on a machine screw.

Commercial screws are threaded right-hand, and left-hand screws should be used only when necessary.

It is standard practice that unless otherwise specified, right-hand thread will always be furnished.

In order to standardize and avoid too many commercial kinds of screws, the American standard "class 2, free fit" screws should always be favored when deciding on kind of fit to use for screws in general manufacturing.

In general the screw is a good means of fastening one part to another, especially when the parts have to be taken apart frequently.

STEAM ENGINE AND BOILER

August Flam, John Marshall High School, Los Angeles, California

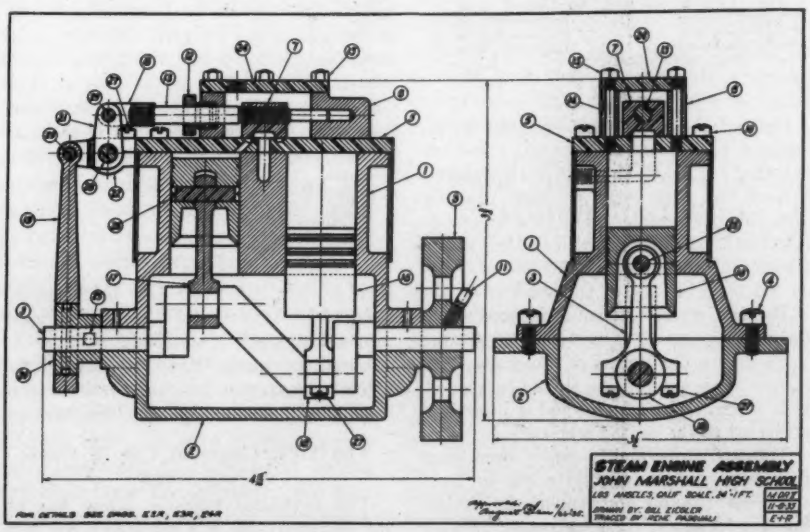
The set of five drawings showing full details and assembly of a toy engine and boiler represents a compact project suitable for the drafting classes as well as for the school shops.

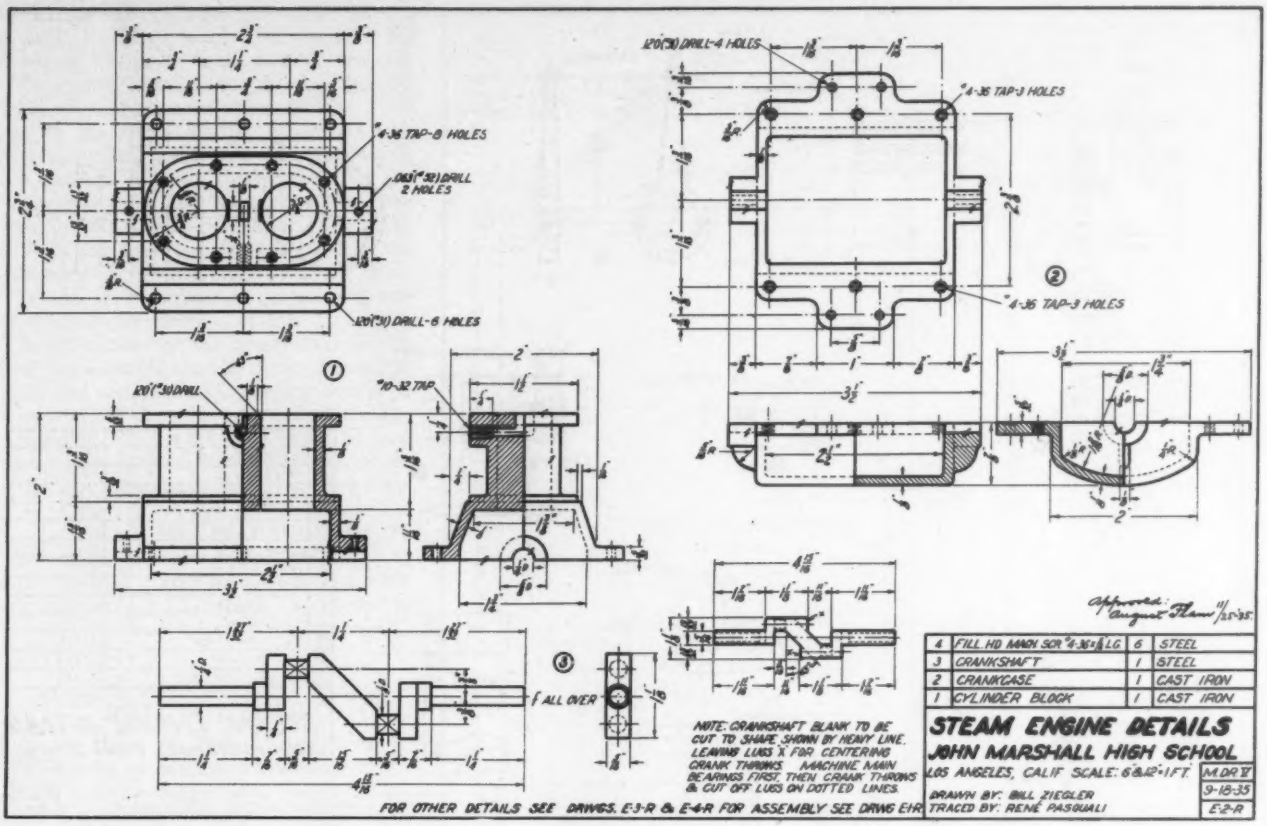
Drawing E-1-R is the enlarged scale assembly, showing in the two sectional views, with piece numbers in circles, the parts which are detailed on sheets E-2-R, E-3-R is cross-referenced. Part numbers 1, 2, 3, and 4, the cylinder block, crankcase, crankshaft, etc., are detailed on drawing E-2-R. Part numbers 5 to 15 — the cylinder head, valve, valve chest, pushrod, flywheel and small parts — are shown on drawing E-3-R. Parts 16 to 30 — the piston, connecting rod, eccentric, eccentric rod, bell crank with lesser details — are shown on drawing E-4-R. The sheet-metal lagging, not detailed elsewhere, and which may or may not be used, is shown on the assembly drawing E-1-R.

No originality is claimed for the steam engine, except in the method of presentation. Simplification and clearness have been aimed at, and it is hoped, that at least to some extent, these vital and desirable objectives have been attained.

The electrically heated boiler which accompanies the engine drawings, has several novel features that will be readily seen by a study of the details on drawing E-5. A hollow cylinder of convenient thickness from No. 16 to No. 10 gauge, may be used for the shell, and somewhat slightly heavier sheet for the ends, which should be welded in carefully. A stay bolt is run through the center, and two straps provide the necessary support for mounting on the base. A pan directly under the boiler, made up of insulating material, carries the heating element. The details of this unit may be varied to suit the convenience of the electric shop. The main objective is to provide a heating element of sufficient capacity to make steam as quickly as possible after plugging in. The fittings for the simple water gauge are made of a pair of interchangeable elbows and nuts. These are welded to the head. Washers of cork, fiber or rubber should be provided to make tight joints. The filler plug made of a ring welded on the top of the shell, should be provided with a screw about 5/16-in. or ⅜-in. diameter for replenishing the water supply. The steam outlet and its union is of simple design, and should be made steam-tight. The safety valve is made so that the blow-off pressure may be changed at will. The head of the countersunk screw seated on the nut at the top, provided the valve. It should be noted that the hole in this nut through which the valve stem passes, ought to have a clearance from 1/16 in. to ⅛ in. on the diameter. Also this nut may be easily unscrewed, thus allowing removal of the valve assembly. With the small nut washer removed from the valve stem, the valve spring may be exchanged for a lighter or stiffer one, to permit blowing off at lower or greater steam pressure. Experience has shown that the engine might speed up sufficiently to cause concern, and should the safety valve *seem* ineffective, the simple expedient of pulling out the electric plug will immediately slow the engine down, and gradually bring it to a complete stop.

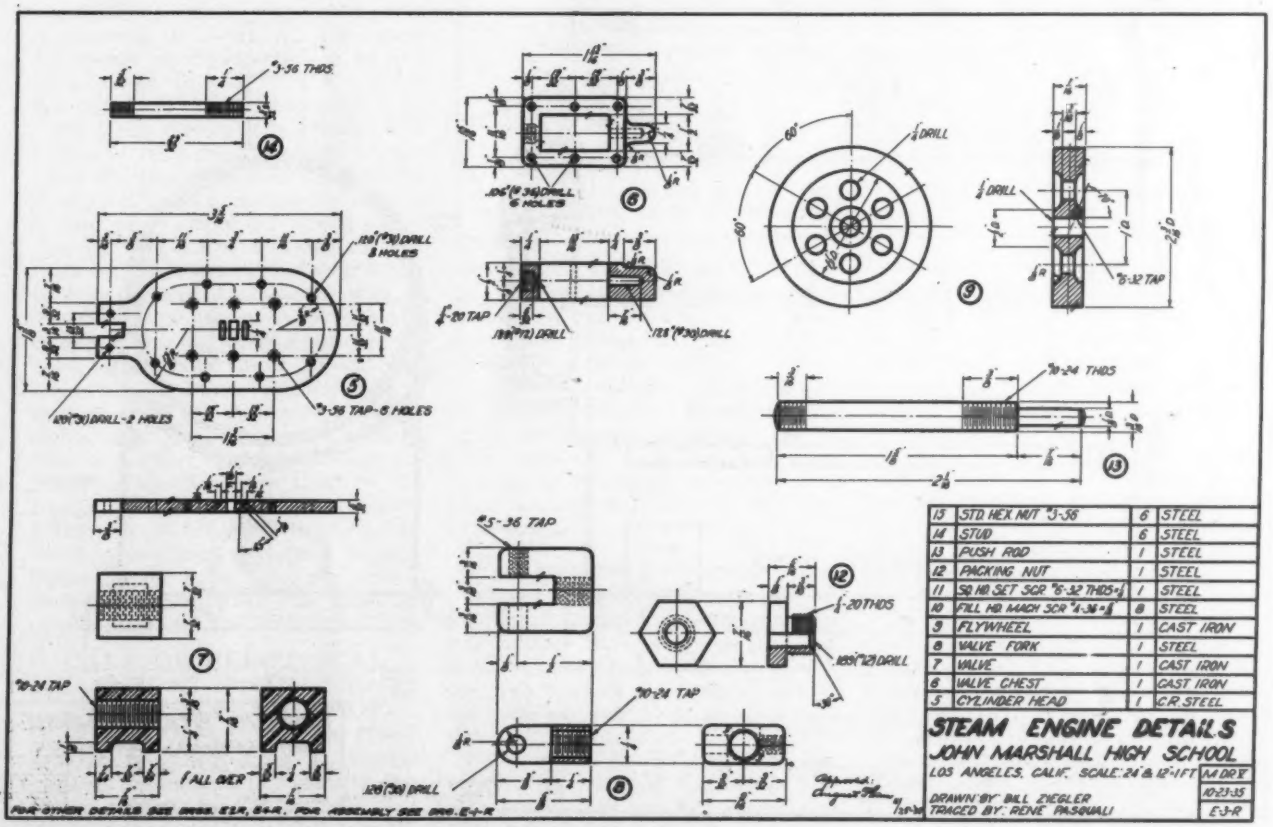
These drawings can be utilized in the shops as they are, or they may be modified to suit individual or local requirements. The woodshop should have no difficulty in constructing patterns for the cast parts, from the details as given. If there is a school foundry, the castings may be made there; or, if necessary, the castings may be made outside, at a comparatively low cost. The machine shop may be expected to




4-36 TAP-8 HOLES
.063"(#52) DRILL 2 HOLES
.120"(#31) DRILL-6 HOLES
.120"(#31) DRILL-4 HOLES
4-36 TAP-3 HOLES
4-36 TAP-3 HOLES
.120"(#31) DRILL
10-32 TAP
f ALL OVER
NOTE: CRANKSHAFT BLANK TO BE CUT TO SHAPE SHOWN BY HEAVY LINE, LEAVING LUGS X FOR CENTERING CRANK THROWS. MACHINE MAIN BEARINGS FIRST, THEN CRANK THROWS & CUT OFF LUGS ON DOTTED LINES.
FOR OTHER DETAILS SEE DRWGS. E-3-R & E-4-R FOR ASSEMBLY SEE DRWG E-1-R
Approved: August Flam 11/25/35

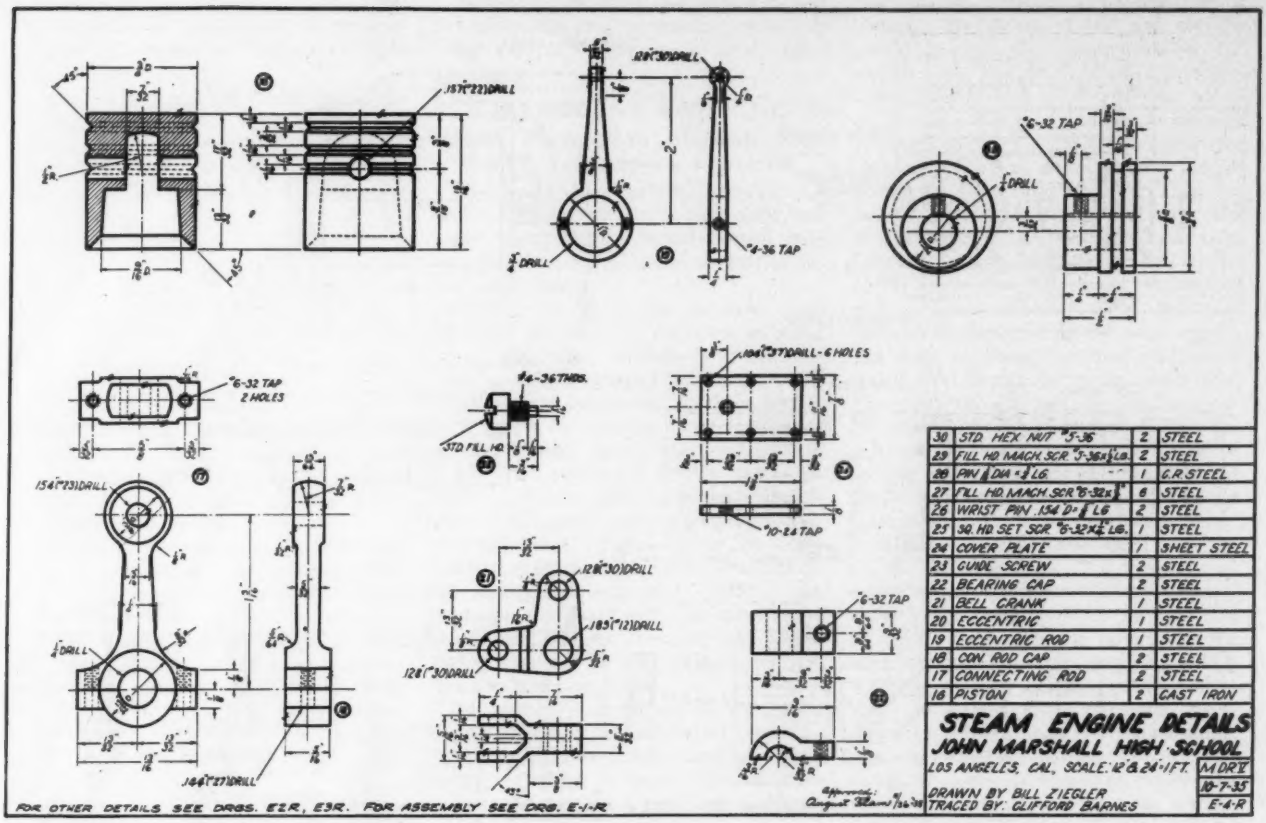
4	FILL HD MACH SCR 4-36 x 5/8 LG	6	STEEL
3	CRANKSHAFT	1	STEEL
2	CRANKCASE	1	CAST IRON
1	CYLINDER BLOCK	1	CAST IRON

STEAM ENGINE DETAILS
JOHN MARSHALL HIGH SCHOOL
LOS ANGELES, CALIF. SCALE: 6 & 12"=1 FT. M.D. R'Y
DRAWN BY: BILL ZIEGLER 9-18-35
TRACED BY: RENE PASQUALI E-2-R



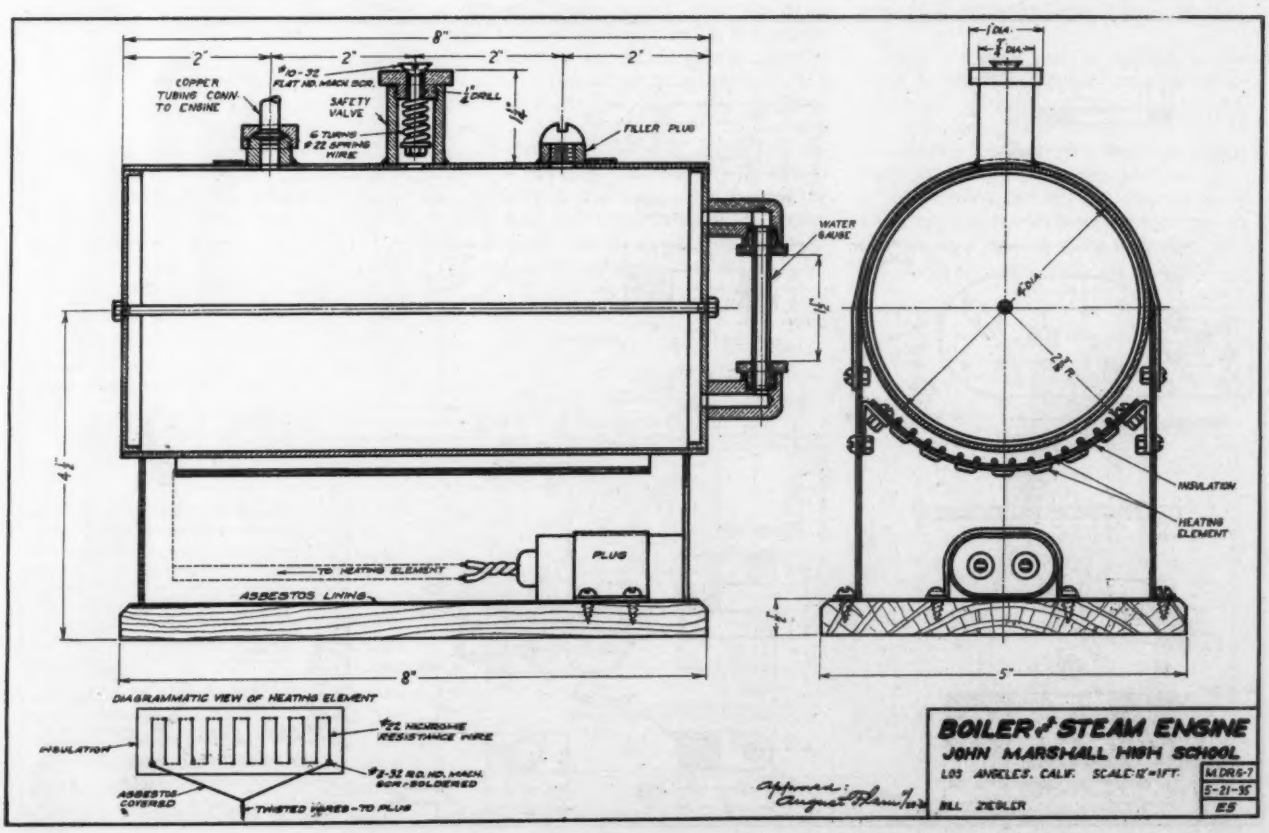
15	STD HEX NUT 3-56	6	STEEL
14	STUD	6	STEEL
13	PUSH ROD	1	STEEL
12	PACKING NUT	1	STEEL
11	SQ HD SET SCR 8-32 THDS x f	1	STEEL
10	FILL HD MACH SCR 4-36 x f	8	STEEL
9	FLYWHEEL	1	CAST IRON
8	VALVE FORK	1	STEEL
7	VALVE	1	CAST IRON
6	VALVE CHEST	1	CAST IRON
5	CYLINDER HEAD	1	C.R. STEEL

STEAM ENGINE DETAILS
JOHN MARSHALL HIGH SCHOOL
LOS ANGELES, CALIF. SCALE: 24 & 12"=1 FT. M.D. R'Y
DRAWN BY: BILL ZIEGLER 10-23-35
TRACED BY: RENE PASQUALI E-3-R



30	STD. HEX NUT #5-36	2	STEEL
29	FIL. HD. MACH. SCR. #5-36 x 1/2 LG.	2	STEEL
28	PIN 1/4 DIA x 3/4 LG.	1	C.R. STEEL
27	FIL. HD. MACH. SCR #6-32 x 3/8	6	STEEL
26	WRIST PIN .134 D x 1/4 LG	2	STEEL
25	SQ. HD. SET SCR #6-32 x 1/4 LG.	1	STEEL
24	COVER PLATE	1	SHEET STEEL
23	GUIDE SCREW	2	STEEL
22	BEARING CAP	2	STEEL
21	BELL CRANK	1	STEEL
20	ECCENTRIC	1	STEEL
19	ECCENTRIC ROD	1	STEEL
18	CON. ROD CAP	2	STEEL
17	CONNECTING ROD	2	STEEL
16	PISTON	2	CAST IRON

STEAM ENGINE DETAILS
JOHN MARSHALL HIGH SCHOOL
LOS ANGELES, CAL. SCALE: 12" & 24"=1 FT. M.DR.Y. 10-7-35 E-6-R
DRAWN BY BILL ZIEGLER
TRACED BY CLIFFORD BARNES



BOILER & STEAM ENGINE
JOHN MARSHALL HIGH SCHOOL
LOS ANGELES, CALIF. SCALE: 12"=1 FT. M.DR.S-7 5-21-35 E5
BILL ZIEGLER

machine the castings, and make all the small machined parts, and assemble the engine. The pupils in the electric shop may be inspired to make several boilers, so that the most efficient may be used.

As far as the drafting classes are concerned, either the details may be used as a problem to make the assembly, or the assembly used as a layout from which to make details. In addition, a great many variations may be included both in the drawing of the details and assembled views. Outside views in place of sections, and vice versa may be made, in case of the details. A half-section of the longitudinal section of the assembly may be drawn, instead of the full section shown. Copying should be avoided. If it must be resorted to, the student's own details should then be used to make the assemblies. These assemblies should serve as a check on the correctness of the details.

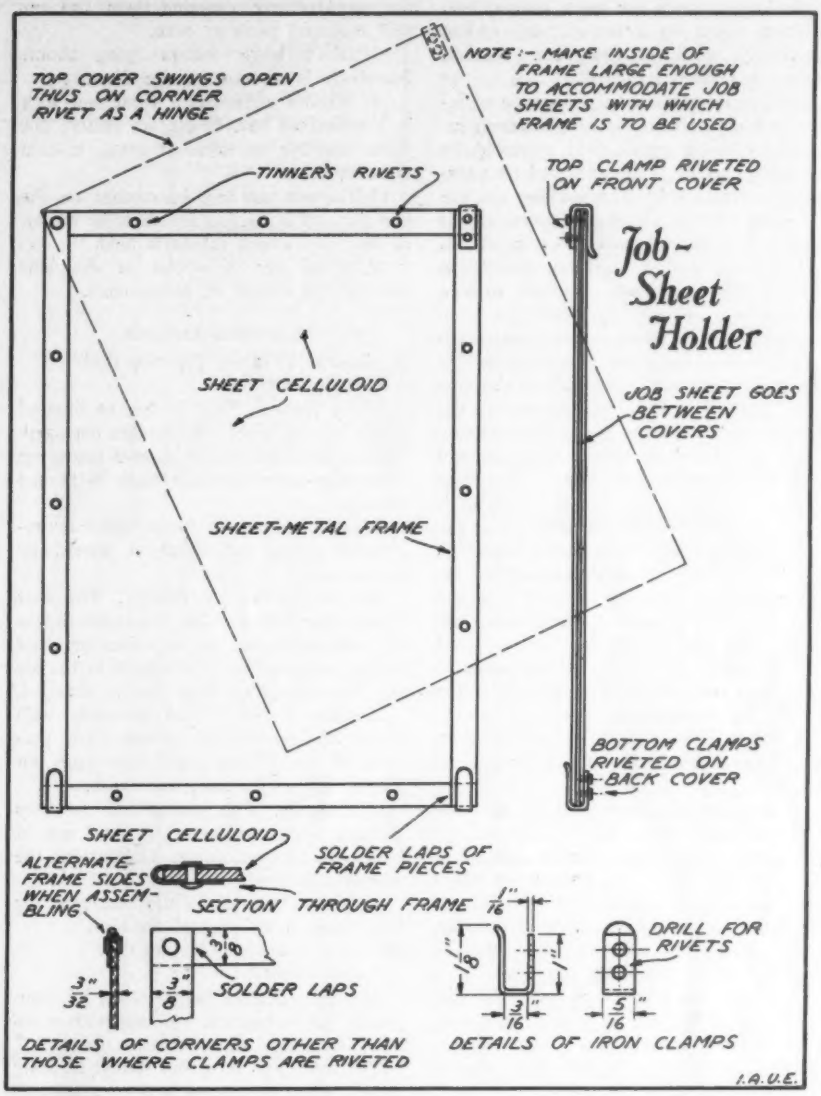
In a word, the method of utilizing the set of drawings for engine and boiler in the drafting classes are legion, and their adaptation to individual requirements depends on the originality and ingenuity of the instructor.

A JOB SHEET OR BLUE-PRINT HOLDER

E. A. Rerucha, Wakefield, Michigan

Possibly all of us have had experience with valuable instruction sheets or blueprints becoming torn or soiled while being used in the workshop. A holder such as described in this article will go a long way in preserving the sheets, and at the same time permit two different prints to be used in the frame. Or both sides of a single sheet, if printed on both sides, may be read.

The holder consists of two frames with a piece of sheet celluloid riveted in each frame. The frames are made out of No. 24 gauge sheet metal. Each frame is made up of four pieces, formed by doubling over a strip of the metal, riveted, and soldered at the corners. Insert celluloid sheet before fastening together. Alternate the sides of the frame at the corners as shown in the drawing, as this will permit all parts of the frame to fit together closer. Use flat-head tinner's rivets and flatten the rivet heads as much as possible. At the corners where the clamps are riveted, it is not necessary to rivet the frame separately. Make the clamps to the dimensions shown in the drawing, and make the final necessary adjustments by bending so that the two covers are held together securely. On large frames it will be necessary to provide clamps along the sides. Use small-size tinner's rivets and drill holes accordingly.


NOTE:- MAKE INSIDE OF FRAME LARGE ENOUGH TO ACCOMMODATE JOB SHEETS WITH WHICH FRAME IS TO BE USED
TOP COVER SWINGS OPEN THUS ON CORNER RIVET AS A HINGE
TINNER'S RIVETS
TOP CLAMP RIVETED ON FRONT COVER
Job-Sheet Holder
SHEET CELLULOID
JOB SHEET GOES BETWEEN COVERS
SHEET-METAL FRAME
BOTTOM CLAMPS RIVETED ON BACK COVER
SHEET CELLULOID
SOLDER LAPS OF FRAME PIECES
ALTERNATE FRAME SIDES WHEN ASSEMBLING
SECTION THROUGH FRAME
DRILL FOR RIVETS
SOLDER LAPS
DETAILS OF CORNERS OTHER THAN THOSE WHERE CLAMPS ARE RIVETED
DETAILS OF IRON CLAMPS
I.A.U.E.

CARE OF ELECTRICAL MEASURING INSTRUMENTS IN THE SCHOOL SHOP

H. Trelease, Bloomfield, New Jersey

To maintain the accuracy of electrical measuring instruments, it is essential that they be carefully handled and used.

When instruments are received from the manufacturer, carefully read and study their wiring diagrams and the instructions for installing and operating. If this is not done, incorrect readings and burned-out windings may be the result.

It would be well for students to note the manner in which the instruments were packed by the manufacturer, so that at some future time if it became necessary to return an instrument for repairs, every precaution may be taken in packing it to avoid damage.

Installing Instruments

Students should get acquainted with instruments before installing them, and make sure whether there is a resistance box, shunt, or current transformer that is to be used with it. Check the diagrams carefully and make sure that the apparatus is complete.

Voltmeters. When connecting voltmeters of any type to a circuit, be sure the connections are clean and well insulated to prevent the formation of a short circuit.

Ammeters. When connecting straight through ammeters, make sure that the connection to the main cable is clean and securely made. Instruments have been destroyed because bad connections developed sufficient heat to melt the soldered joints between the winding and terminal inside the instrument.

Shunts. The instructor cannot lay too much stress on the care of shunts. When installing the shunts, care should be exercised to make sure that the leads from the shunt to the instrument are of the same resistance as those supplied or specified by the maker.

Do not use just any old leads, for they may cause the instrument to show inaccurate readings. When an ammeter reads high, the resistance of the leads is low, while leads of high resistance will cause the instrument to read low.

The main connections must be large enough to carry off any heat generated at the point of contact with the shunt. Care should be exercised that the ends of the

leads do not touch the main connections.

Never reject an instrument as reading incorrectly until it has been checked against a verified standard.

Induction Instruments. This type of instrument depends on the eddy currents induced by the magnetic field produced by the main current. They are used on alternating currents only. The working coil has a certain number of ampere turns, and is wound on a horseshoe-shaped iron circuit.

The rotating disk is freely pivoted in jeweled bearings, and is fitted with a pointer to travel over the scale.

Care should be taken to use these meters on a circuit of the same frequency as that for which they are calibrated, as the currents induced in the disk are entirely dependent on the rate at which the magnetic fields cut the disk. Shunts are not used with the induction-type meter.

Safety Precautions

1. Always handle instruments carefully.
2. Never keep instrument uncovered for any length of time, as the dust will get into the jewels, causing the moving element to become "sticky."
3. To avoid damaging the fine points of the pivots and the polished surfaces of the jewels, lay instruments down gently.
4. Keep all instruments reasonably clean by wiping them periodically with a clean soft rag.
5. Examine all connections, shunt leads (especially flexible), and see that all are clean and not partially broken through.
6. On voltmeters and wattmeters which have potential switches, it is advisable to leave the switch open as much as possible, even though the winding might not be damaged by a continuous current.
7. Never clean the glass over the dial while the instrument is in use, as it may cause a static charge. This charge will frequently attract the pointer and cause a temporary error in the reading.
8. Check the zero of instruments, and adjust if necessary.
9. Check all instruments occasionally by laboratory standards.
10. High-grade instruments are shielded from stray fields; nevertheless, it is good practice to avoid subjection of the instrument to stray fields. Twisting the leads together will eliminate one source of stray fields. Other sources of stray fields are rheostats, reactive coils, dimmers, circuit-breakers, etc. Avoid these by placing the instruments a considerable distance away from their source.
11. Keep instruments, whether in use or out of use, away from vibration, as the pivots or jewels might become damaged.
12. Never leave a voltmeter or wattmeter connected in a circuit, as the current or voltage of the circuit might be increased in some way or other.
13. Blow out the dirt that accumulates behind the meter; it may lead to a breakdown of insulation later on.
14. When instruments are received from the manufacturer, examine them and report damaged parts at once.
15. Don't leave meters lying about. Somebody is sure to damage them.
16. When a meter has a shunt sent with it, a resistance box, or contact switch, put them together at once. It saves trouble afterwards.
17. Do not put any instrument on the bed plate of a running generator or motor, or near any strong magnetic field.
18. Keep any directions or diagrams sent by the makers of instruments.

Common Defects

Mechanical Troubles (Moving-Coil Instruments)

Sticky Action. This is due to blunted pivots, or the jewel bearings are damaged. This is indicated by the pointer taking up a position when the instrument is tapped gently.

Remedy. Pivots to be repaired by regrinding them, and damaged jewels, by replacement.

Sluggish Action of Pointer. The hair spring may have one or two turns caught on some projection, or iron dust or other foreign material may be lodged in the air gap. No definite readings can be obtained.

Remedy. Carefully free the spring with a pair of fine tweezers. Remove any particles of iron with a needle and brush out the air gap with a soft, fine brush.

Overloading. The pointer will not keep at zero when the meter is tilted out of level, due to overloading. This strains the pointer and bends it.

Remedy. The pointer must be carefully bent back to its original position.

Electrical Troubles (Moving-Coil Instruments)

Electrical defects are detected by comparing the instrument readings with a reliable standard measurement.

The meters to be tested should be truly at zero when no current is passing through them, then connect the standard instrument to the meter under test, so that any defect in external leads or contacts will affect both meters.

Lower Reading than Standard. This is caused by the fall in strength of permanent magnet.

Remedy. Reduce series resistance in case of voltmeters, or reduce shunt resistance in ammeters.

In case that some of the turns of the windings on the moving coil become short-circuited, it will be necessary to rewind series resistance.

Higher Reading than Standard. Ammeters may read high when the shunt has been stained and the joints fractured. The resistance of the shunt is increased, before the volt drop on it for a given current. Pressing on the strips will often vary the reading on the ammeter when the joints are doubtful.

Remedy. Resolder the defective joint and readjust the shunt.

When there is a break in the instrument circuit, there will be no deflection when the current is turned on. Examine each section carefully for the break, put a few millivolts only, direct on the moving coil. When the break is located, discretion must be used in repairing it.

Mechanical Troubles (Moving-Iron Instruments)

Sticky Action. Trouble may be experienced in this type from the same causes as the moving-coil types. The damping plunger fouling in the air chamber will cause stickiness.

Remedy. The cap of the air chamber to be removed, and carefully bend the plunger arm until free.

Electrical Troubles (Moving-Iron Instruments) Voltmeters

Lower Reading than Standard. Due to breakdown between the turns of copper portion of winding on the working coil.

Reading Higher than Standard. Due to breakdown turns on resistance portion of circuit.

Remedy. Rewind the coil in either case.

Ammeters

These meters seldom give any trouble from an electrical cause.

Gravity-control instruments sometimes develop a reading error, due to the control weight shifting. When the weight moves downward on its stem, the meter will read low, and in case it falls off, the readings will be considerably higher.

Remedy. Replace the weight and adjust till meter reads correctly.

The insulation of all instruments is likely to break down between the winding and the case, which, however, is often due to dirt, and moisture collecting around the terminals.

When internal trouble arises, examine for cracked or broken bushes, and replace where necessary.

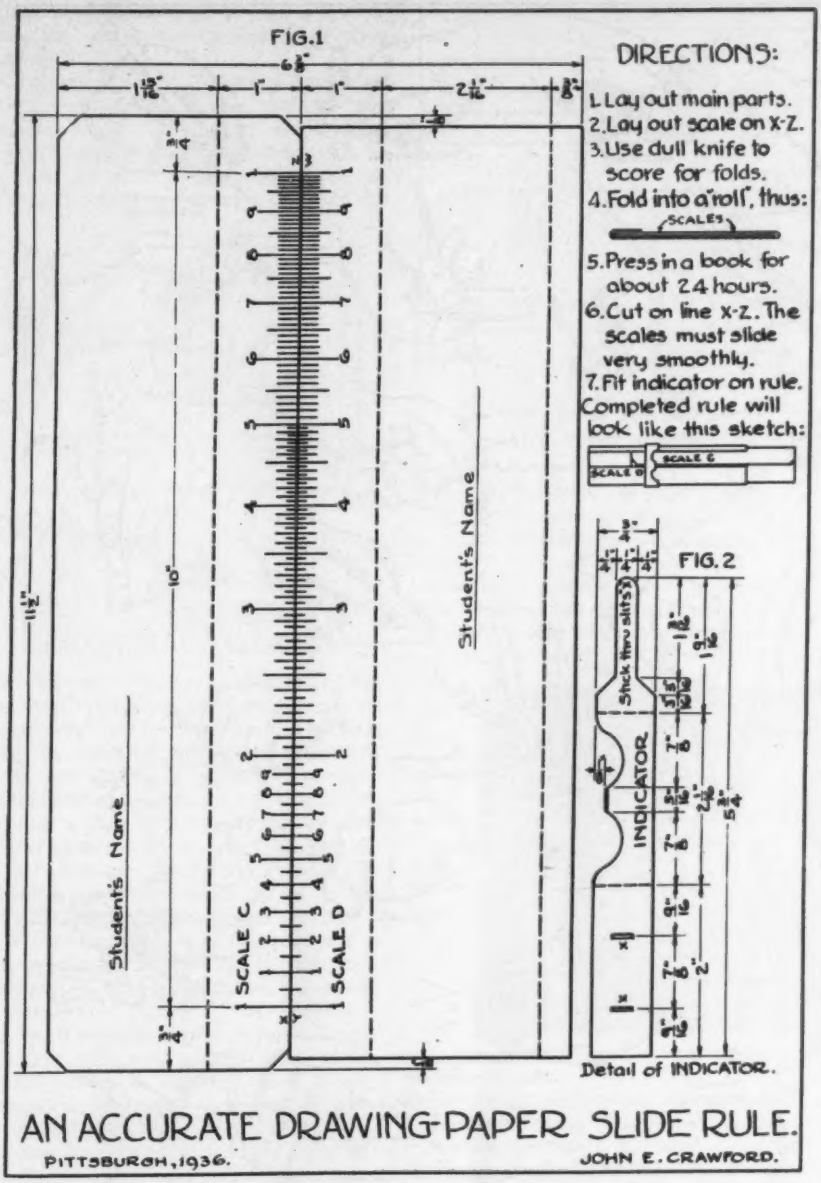
Hot-wire instruments generally get burned out completely from overload, and the only remedy is to restring and adjust the meter.

Dynamometer instruments are subject to breakdowns on the moving coil, similar to the permanent-magnet variety, and on the fixed coils as on the moving-iron types.

AN ACCURATE BOY-MADE SLIDE RULE

John Edmund Crawford, Pittsburgh, Pennsylvania

The simple slide rule has so much practical value to the student during his high-school career, that the device certainly should be part of his school experience. Given a fair chance to learn how to use the slide rule readily on the daily problems of his classes, the student will find an added interest in his schoolwork. As was so ably expressed at the Chicago meeting of the A.V.A. last December, by Dr. Gerald Whitney of the University of Pittsburgh, the use of any visual or mechanical device to clear away some of the more arduous work for the boy, will give him



further desire to enjoy his classes, and thus enable him to get more from them.

The most serious handicap, up to the present time, in introducing the slide rule to the high-school student, is the item of cost. Reasonably cheap rules, supplied by the school, are not constructed sturdily enough to long withstand use by students who do not feel the pride of ownership and hence do not take adequate care of the device.

For the last five years the writer has used class time to direct classes in making remarkably accurate slide rules out of ordinary drawing paper. These paper rules have been copied by many boys in other departments of our school, which seems to indicate the merits of the device from the most important viewpoint, that of the student himself.

Figures 1 and 2, show all the details of this rule, which has a 10-inch scale. Squarely cut drawing paper, 9 in. by 12 in., is large enough for the parts, and obviates use of drafting T-square and triangles, where these things are not readily available.

The general layout, Figure 1, is quite simple, but must be accurately done. The logarithmic scale is not too difficult for the high-school student to lay out accurately himself, with the aid of a 10 in. by ¾ in. wide strip cut from standard 10 in. semi-logarithmic graph paper. This paper costs about twenty cents per dozen sheets, which may be cut into about 85 to 100 strips. Each student should have his own strip of this paper; he can use it over and over to lay out other slide-rule scales. Follow the scale shown in Figure 1, to mark both scales C and D.

Check the hand-drawn scales by comparison with the 10 in. standard "log" paper strip. Make corrections wherever necessary. A further check may be made by placing the left end of the strip scale at 2 on the drawing scale. Every other division on the drawing must exactly match the divisions on the narrow strip, up to 5 on the drawing. From 5 to 10 (the right end 1), the divisions all must exactly match on drawing and strip. Boys like to strive for a good job in making this slide rule, because they know the finished product will be theirs to use as a "real slide rule." The pride of ownership promotes good workmanship on any job.

When the scale has been perfected and neatly lettered, cut out the main piece, containing both scales C and D. Score and fold on the lines, as shown in the folding diagram Figure 1. Do not cut on the scale line, X-Z, until the folded rule has been thoroughly pressed under weights for several hours. This will insure a smooth sliding action, and neatly creased folds that will not deform easily.

The paper indicator, made as detailed in Figure 2, needs no paste or glue, and slides readily over the finished rule. But energetic boys usually change this part for a clear celluloid indicator, with a carefully scribed line on its inside.

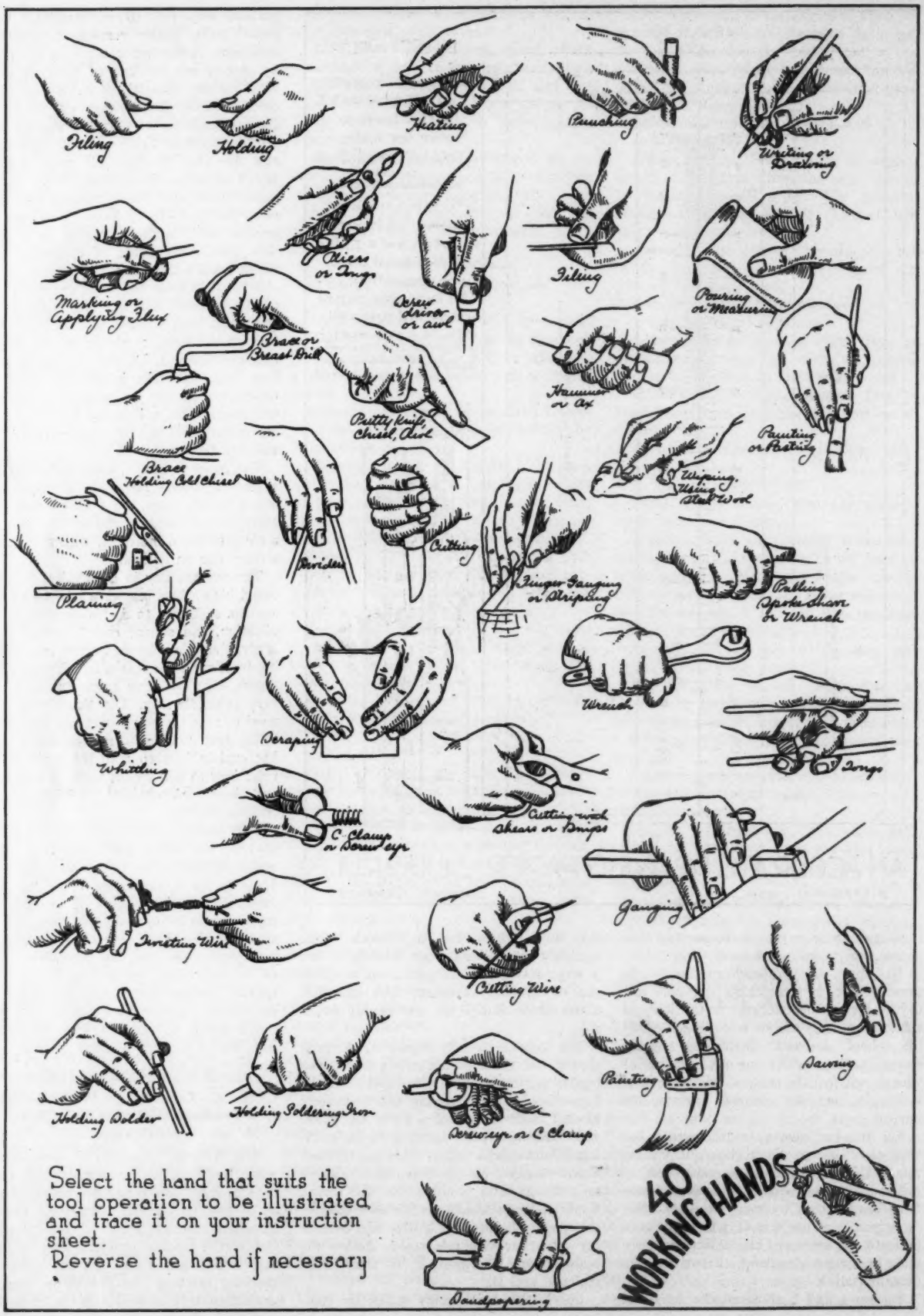
The average boy in a technical or vocational high school can learn how to use this simplex slide rule to do his division, multiplication, and square root "chores," if he is given simple rules and examples. Changing fractions to decimals, figuring per cents, tapers, etc., will give ample practice in a very practical way. The teacher will not need to urge the boy to use this very interesting tool. Simple instruction sheets need but explain how to read the scale of the rule; how to add its distances to multiply; and how to subtract its distances to perform division.

This drawing-paper slide rule, as a school project, has many good outcomes. It is really practical to the boy in his daily work. It leads to a professional use of such devices, in his later years. It increases his confidence in his own abilities, and provides an interesting range of drafting practice of a very accurate type. His inquisitive interest in logarithms, exponents, etc., will be spurred. And his boy's heart will rejoice in his happy experience at doing with two cent's worth of material what is usually done by his dad's five-dollar device.

TEACHING AIDS

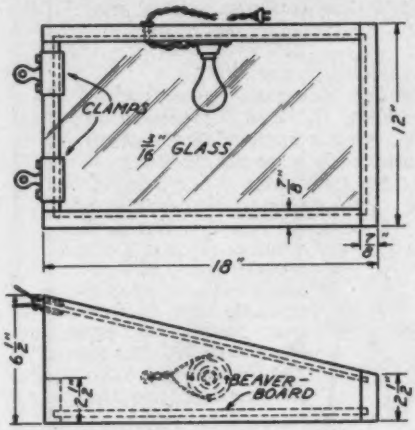
Carl v. Lindeman, Western State Teachers College, Paw Paw, Michigan

The average teacher of general-shop work has been rather perplexed in these days of large classes and decreased budgets as to how to conduct his classes without impairing the efficiency of his program. One of the greatest problems that he must face is the question of the duplication of teaching material, for though he may be surrounded with a wealth of material, he


Filing
Holding
Heating
Punching
Writing or Drawing
Marking or Applying Flux
Axes or Tongs
Auger drill or awl
Filing
Pouring or Measuring
Brace or Breast Drill
Putty knife, Chisel, Awl
Hammer or Ax
Painting or Pasting
Brace Holding Cold Chisel
Dividers
Cutting
Wiping, Using Steel Wool
Planing
Finger Gauging or Stripping
Pulling Spoke Shave or Wrench
Wrench
Whittling
Scraping
Tongs
C Clamp or Screw eye
Cutting with Shears or Snips
Twisting Wire
Gauging
Cutting Wire
Holding Solder
Holding Soldering Iron
Screw eye or C Clamp
Painting
Sawing
Sandpapering
Select the hand that suits the tool operation to be illustrated and trace it on your instruction sheet.
Reverse the hand if necessary
40 WORKING HANDS

must have it organized in such a systematic way that it may be readily and easily presented.

Equipment for duplication of work is not very often found in the average small school, so the teacher must devise some system whereby he may make drawings on stencils for the mimeographing of job and instructional sheets. To meet this need the



"stencilscope," shown in Figure 1, was designed. This simple stencilscope may be made from soft or hard wood. The glass may be secured from an old automobile door, and may be frosted by applying a solution of epsom salts to the glass, or by pasting a sheet of tracing paper or cloth to the underside of the glass. A small 20-watt bulb is used for the illumination. The stencil is held by two small clamps. It also may be held in place with Scotch tape.

The author has learned by experience in the preparation of job sheets that good illustrations are essential and since few industrial-arts teachers are proficient artists, it is most helpful to have various kinds of aids, such as the "Hand Guide Sheet," shown in Figure 2. Such a help becomes most useful when making illustrations showing the correct way of holding and using the common tools. By selecting the hand that most suits the tool operation to be illustrated, the proper tool can be substituted or drawn.

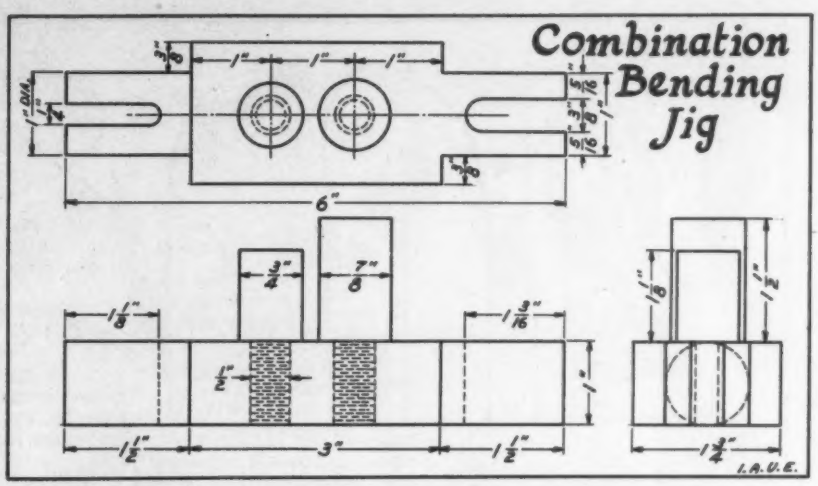
COMBINATION BENDING JIG

Warren A. Walker, Oswego State School, Oswego, New York

The combination jig described herein may be used for quite a number of operations employed in the bending of soft metals, particularly of wrought iron.

The dimensions of the jig may be altered if desired, but under ordinary working conditions this particular size has been found quite satisfactory.

Material. There are several kinds of materials out of which this bending jig may be made, such as hot-rolled steel, tool steel, and molybdenum, but cold-rolled steel has proved quite acceptable and satisfactory. A piece of cold-rolled steel 6 by 1¾ by 1 in. is required.



Layout. With the use of a scriber and a combination square, lay out the piece to the finished dimensions shown in the illustration.

Squaring Up. First square up the entire piece, then cut the two ends down to size. This may be done either in a shaper or with a hack saw, letting the lines show. The shaper will naturally afford a better opportunity for obtaining square and true cuts.

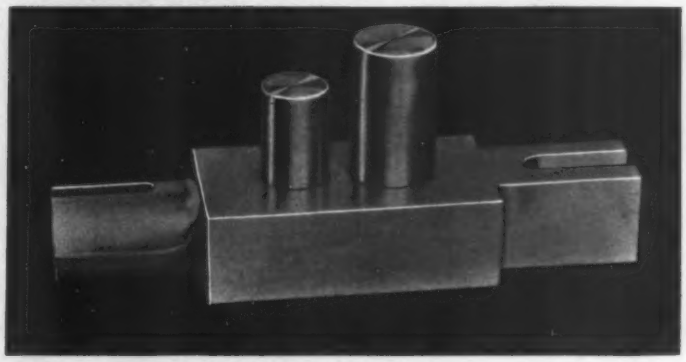
Drilling. Drill two 27/64-in. holes in the center piece, a ⅜-in. hole 1 in. in from the square end and ½ in. from the edge, and a ¼-in. hole 1 in. from the end and ½ in. from the edge. The two last mentioned are for the slots.

Turning the Round End. Center-punch and then center-drill each of the two ends. Place a dog on the end that is to remain square and insert the piece between the centers of the lathe. Turn the free end with the ¼-in. hole in it down to 1 in. in diameter, and polish with emery and crocus cloth.

Cutting the Slots. Next, cut out the ⅜-in. and ¼-in. slots on the milling machine or cut them out with the hack saw. Cut each slot down to the holes that have been drilled. Lastly, smooth up the slots while the piece is still in the vise.

Tapping. The next step is to tap the 27/64-in. holes with a ½-in. U.S.S. tap. Cut threads through the entire length of the holes. Be sure to back up the tap at every thread cut so that all of the threads will be clean and unbroken.

Turning the Pins. Select a piece of round cold-rolled steel, 1 in. in diameter and 6 in. long. After center-punching and center-drilling this piece of steel on both ends, place it in the lathe between the centers and turn up the two pins.



The bending jig ready for use

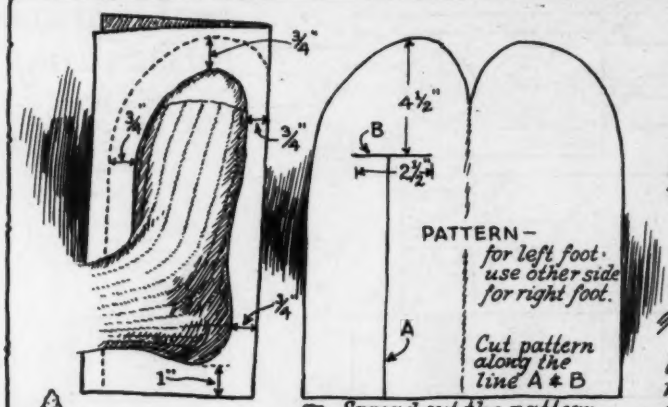
Cutting the Threads. Place the ⅞-in. end of the large pin in a collet in the lathe, and cut threads on the ½-in. section with a U.S.S. ½-in. die. In like manner, cut threads on the ¾-in. pin. Screw both of the pins in place, then turn over the jig, and file or grind off the part extending beyond the bottom surface.

Final Finishing. Polish all surfaces of jig with fine emery and crocus cloth, and then apply oil to prevent rusting.

SANDPAPER-DISK CEMENT

A handy adhesive for fastening sandpaper to the sanding disk may be made by melting and thoroughly mixing 8 oz. beeswax, 2 oz. rosin and 10 oz. paraffin. Allow the mixture to cool into a slab about 1 in. thick. Then cut the slab into blocks. Press a block of the cement against the revolving disk and move it back and forth until an even coat of cement has been applied. Then stop the disk and press the paper in place.

The sandpaper adheres very well although when necessary, it may be pulled off easily.



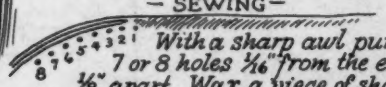
1 Fold a piece of paper and place foot on it ¾" from fold. Draw a line ¾" away from toes to widest part of foot and then parallel with fold to about 1" beyond heel. Cut out along dotted line.

2 Spread out the pattern. Then draw line A midway between edge and fold. Next, draw line B at right angles to line A at point where foot is widest. Make length of line B equal to width of foot minus about 1". Dimensions shown above are for a size 8 foot.

3 Mark patterns on leather to be used. Soft tanned buckskin is best but any soft leather will do. Be sure to turn pattern over for the right foot. The one shown is the left one.

4 Cut the leather around the outside only. Fold the outer side in and sew, starting at C and continuing to end.

— SEWING —



With a sharp awl punch about 7 or 8 holes 1/16" from the edge and 1/8" apart. Wax a piece of shoemakers linen thread and with a small darning needle sew up the part that is perforated as shown here. Pull each stitch as tightly as possible. Then punch another set of holes and sew. Do not try to punch all the way around at one time as the leather may pull out of shape. Don't punch holes too far from edge. Keep thread well waxed.

— TO MAKE AN AWL —

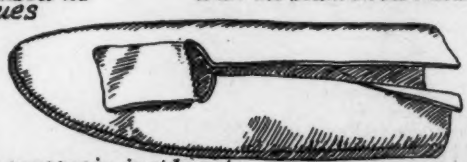
drive a nail into a ¾" dowel and file to a long point.

5 Turn moccasin right side out and cut lines A & B.

6 Cut two pieces of leather 2½" x 3" to be used as tongues

7 Sew tongues in place, using same stitch as before, and with the seam on the inside

8 Now slip the moccasin over the proper foot and determine the length as shown below. Mark with pencil and cut away surplus as shown below, E. Then cut in as shown at X, below, E and F



9 Turn moccasin inside out again and sew as shown at G — Try it on occasionlly to be sure of a good fit.

INDIAN MOCCASINS

DRAWN BY
W. BEN HUNT HALES CORNERS WIS

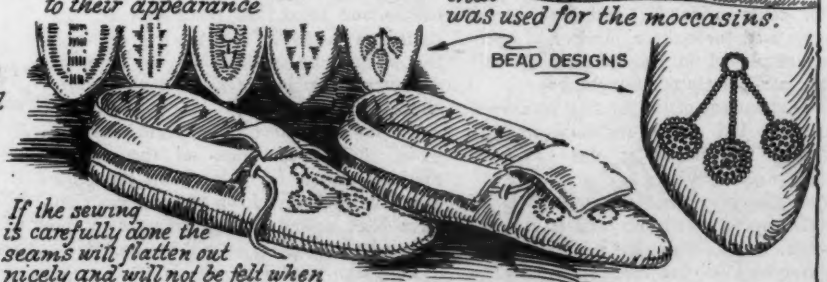
10 The small flap G (right) may be cut off and the heel sewed straight across, H, while the moccasin is still turned inside out.

Or — the flap may be sewed up, I, in which case it should be sewed on the outside.

Be sure that all stitches are pulled up tight and that the thread is well waxed.

11 Cut slots as shown below for the lacing. Cut the lacing from the same leather that was used for the moccasins.

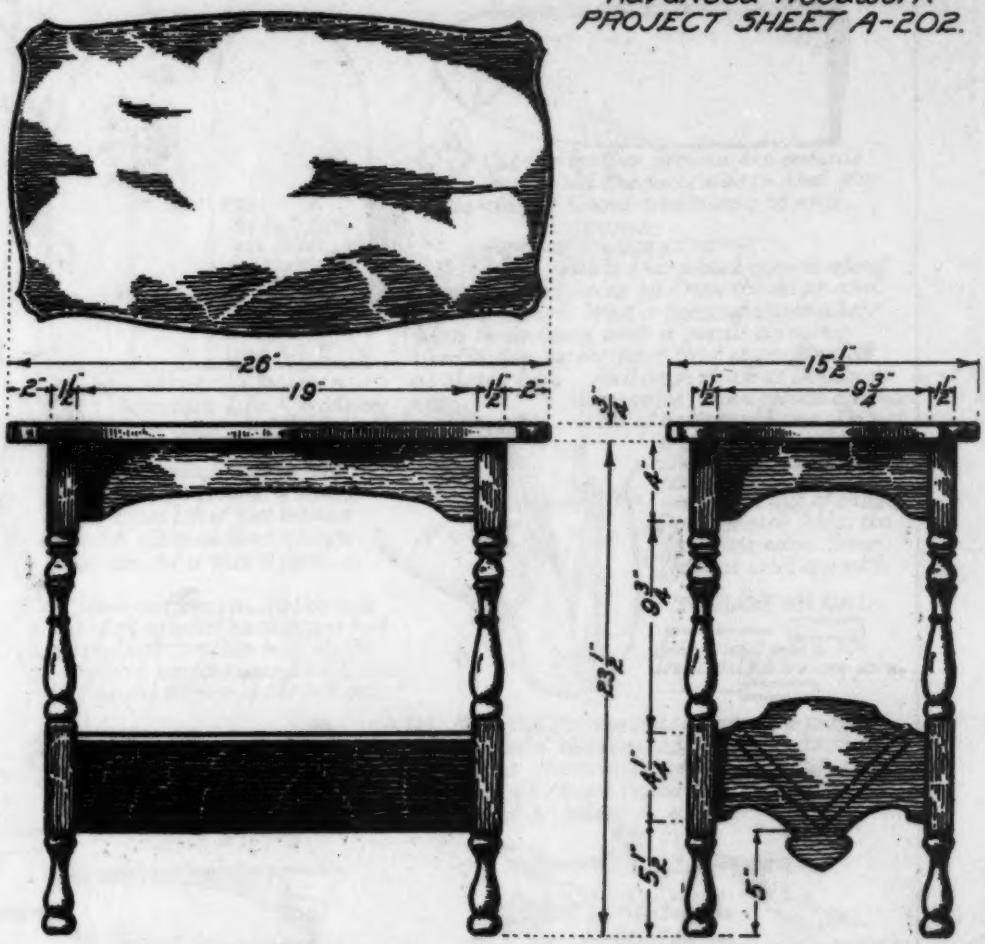
12 The moccasins are now finished but a simple design of colored beads will add a great deal to their appearance



If the sewing is carefully done the seams will flatten out nicely and will not be felt when being worn.

END TABLE

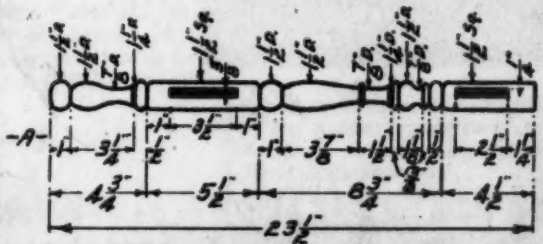
Advanced Woodwork
PROJECT SHEET A-202.



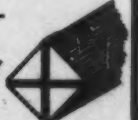
SCALE ½"=1'

"BE UNAFRAID TO BE DIFFERENT" Ray Faudick

LEGS– IN THE ROUGH, THE LEGS MAY BE CUT FROM 1¾" SQUARE STOCK AND MADE 24" LONG.– W-11. JOINT A FACE SIDE AND A FACE EDGE,



USING THE TWO BEST ADJACENT SURFACES FOR THIS PURPOSE. SAW TO WIDTH AND THICKNESS ON THE CIRCULAR SAW.– W-96, W-97. FACE EACH SIDE LIGHTLY WITH A JACK PLANE TO REMOVE MILL AND SAW MARKS. LAY OFF THE MEASUREMENTS FOR THE SQUARE PORTIONS AND THEN SQUARE LINES ACROSS FACE. TAKE THE TWO SAW CUTS ABOUT ¼" DEEP AT EACH END OF LEGS AS INDICATED AT -B- FOR CENTERING ON THE LATHE. DO THIS ON THE BAND SAW. TURN THE CENTER PART FIRST TO AVOID VIBRATION. IN THIS CASE THE TURNING OPERATION IS STARTED WITH THE POINT OF THE SKEW. THIS IS DONE TO PREVENT SPLITTING THE EDGES OF THE SQUARE PORTIONS. BEGIN WITH POINT OF SKEW ABOUT ½" FROM THE SQUARE PART AND GRADUALLY WORK UP TO THE LINES. ROUGH OUT BETWEEN WITH ROUGHING GOUGE TO 1¼" DIAMETER.– W-100



FINISH THE TURNING AND SAND. W-100. SQUARE FINE PENCIL LINES TO INDICATE LENGTH OF THE MORTISES SEE SKETCH AT -A- GAUGE LINES FOR THEIR THICKNESS. BE SURE TO LAY OUT IN SUCH A WAY THAT YOU HAVE A LEFT AND A RIGHT LEG FOR EACH END. NOTE THAT THERE IS ONLY ONE MORTISE AT LOWER PART OF LEG.

Designed by Clifford B. Smith

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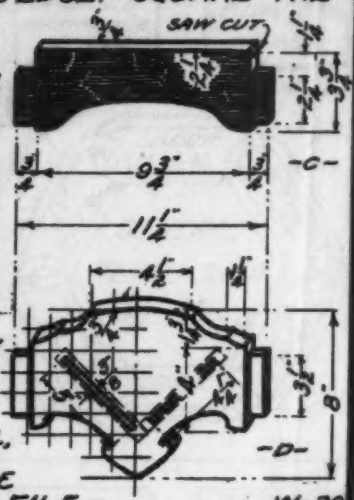
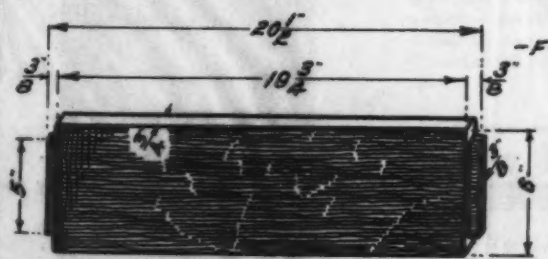
RAILS– DO NOT FORGET TO LOOK FOR THE SMALLEST PIECES YOU CAN FIND. IN GETTING OUT THE STOCK FOR THE RAILS. CUT, IN THE ROUGH, ABOUT ¼" WIDER AND ½" LONGER. THAN THE FINISHED SIZE. PLANE A FACE SIDE ON EACH PIECE, THEN ON THE JOINTER OBTAIN A FACE EDGE. SQUARE THE ENDS TO THE LENGTH ON THE CIRCULAR SAW.– W-1, W-11. ON PAPER OR THIN WOOD OBTAIN THE LAY-OUT FOR ONE-HALF THE DESIGN OF EACH RAIL.– W-6. TRANSFER TO THE RAILS AND BAND SAW JUST OUTSIDE THE OUTLINE. WORK EXACTLY TO THESE LINES WITH BLOCK PLANE, CHISEL, GOUGE AND POSSIBLY THE HALF-ROUND FILE.– W-20.



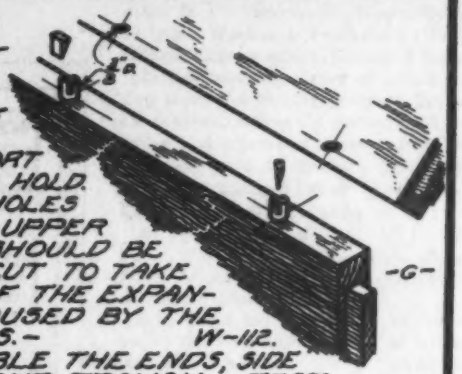
CUT TENONS TO FIT THE MORTISES SNUGLY.– W-120.

REDUCE RAILS TO ¾" THICKNESS AND SAND THEM AS WELL AS THE LEGS. GLUE UP THE END SECTIONS, CHECKING SQUARENESS AND WIND CAREFULLY. REMOVE SURPLUS GLUE.– WT-46.

TROUGH– THE TWO PIECES FOR THE TROUGH SHOULD BE OBTAINED NEXT. ONE IS 5½" AND THE OTHER 6" WIDE. THE THICKNESS AND THE LENGTH OF BOTH PIECES ARE THE SAME. BEFORE CUTTING THE TENONS ON THESE PIECES LAY OUT THE MORTISES SHOWN IN SKETCH -D-, IF YOU HAVE NOT ALREADY DONE SO. BORE AS MANY ⅜" HOLES AS YOU CAN ½" DEEP AND THEN ROUGH OUT WITH CHISELS AND WORK TO THE LINES EXACTLY.–

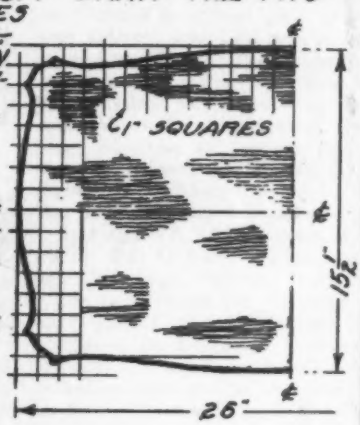


SAND THESE PIECES THOROUGHLY BEFORE FASTENING TOGETHER WITH A DOWEL JOINT. SKETCH -G- EXPLAINS THE METHOD OF MAKING THE SHORT DOWELS HOLD. THE ⅜ HOLES IN THE UPPER PIECE SHOULD BE UNDERCUT TO TAKE CARE OF THE EXPANSION CAUSED BY THE WEDGES.– W-112.

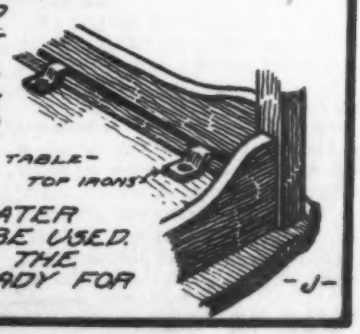


ASSEMBLE THE ENDS, SIDE RAILS AND TROUGH. TEST FOR SQUARENESS, WIND AND THE ALIGNMENT OF THE LEGS.– WT-46. REMOVE ALL TRACES OF GLUE.–

TOP– GLUE UP STOCK FOR THE TOP. USE DOWEL JOINTS.– W-112. FACE ONE SIDE, PAYING PARTICULAR ATTENTION TO REMOVING WIND.– W-1. NEXT GAUGE THE THICKNESS TO ¾". LAY OUT A PATTERN FOR ONE QUARTER OF THE TOP. DRAW THE TWO CENTER LINES SHOWN AT -H-. LINE PATTERN UP WITH CENTER LINES IN TRACING THE OUTLINE. BAND SAW JUST OUTSIDE THE LINES. WORK EXACTLY TO THE LINE, USING SPOKESHAVE, GOUGE AND HALF-ROUND FILE. SLIGHTLY ROUND THE EDGES.–



SIGHT TOP EDGES OF RAILS FOR WIND. IF ANY WIND SHOULD STILL REMAIN BE SURE TO REMOVE IT EITHER WITH A HAND PLANE OR ON THE CIRCULAR SAW.– THE TOP SHOULD BE CLAMPED TO THE FRAME AND CENTERED. FASTEN FINALLY WITH TABLE-TOP IRONS. THESE ALLOW ENOUGH PLAY AS THE TOP SWELLS OR SHRINKS, TO PREVENT SPLITTING.– GIVE THE END TABLE A FINAL INSPECTION. BE SURE EVERY TRACE OF GLUE AND EVERY MARK IS REMOVED. SPONGE THE WOOD IF A WATER STAIN IS TO BE USED. RESAND AND THE TABLE IS READY FOR THE FINISH.–



by Clifford B. Smith, Buffalo, New York

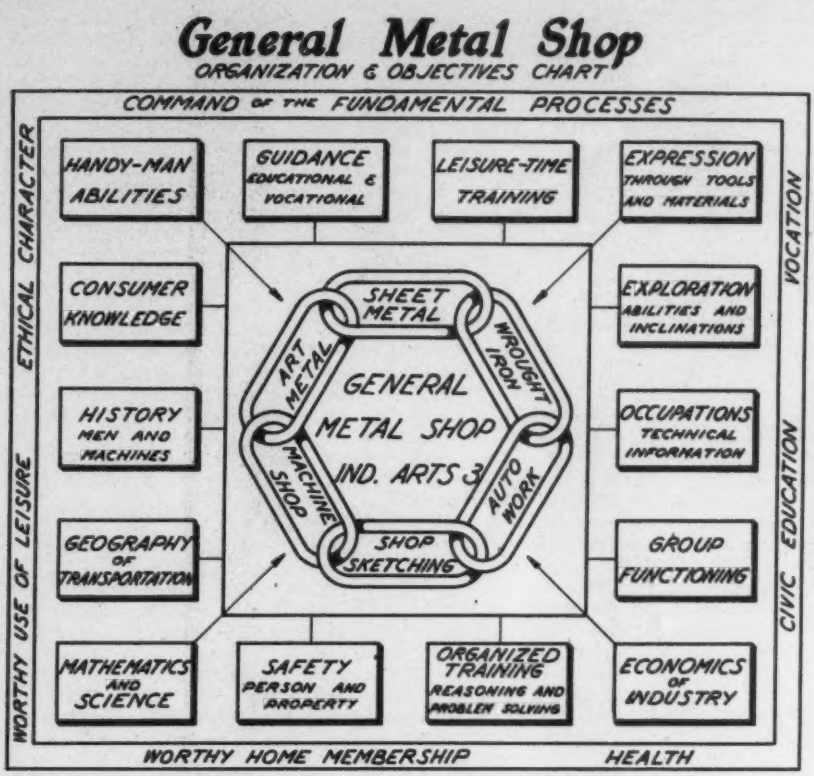


Chart by William J. Becker, Junior High School, Ithaca, New York

Personal News

MR. PAWELEK ADVANCED

Mr. Stanley J. Pawelek, a member of the staff of the department of industrial education at the State Teachers' College, Winona, Minn., has been appointed director of the

STANLEY J. PAWELEK

department, to succeed Mr. Roland M. Torgerson. Mr. Harry R. Jackson, of Charleston, Ill., has been selected to assist Mr. Pawelek.

Mr. Pawelek, a graduate of the Oshkosh Teachers' College in the class of 1923, holds a B.S. degree from the University of Minnesota, and an M.A. degree from the same institution. He has been a member of the teaching staff of the College since the fall of 1932, and before that was an instructor for nine years in the high schools of Minnesota. He has been for some time assistant to the director of the department and has acted as supervisor of shop student teachers in the junior-high-school department of the training school.

As president of the industrial-arts section of the Minnesota Educational Association, he will have charge of the next state meeting to be held in St. Paul in November.

¶ Dr. Louis V. Newkirk, director industrial arts, Chicago, Ill., will teach two graduate courses — vocational education and correlating industrial arts — at Northwestern University, Evanston, Ill., during the coming summer session.

New Publications

55 New Tin-Can Projects

By Joseph J. Lukowitz. Paper, 6 by 9, 80 pages. Price 75 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

The author has succeeded literally in taking the tin can off the ash heap and placing it in the parlor. In this book, there are 55 projects which with comparatively little labor transform parts of the lowly tin can into articles of beauty. There are few tools required, the tin cans cost nothing and the results are more than gratifying to the worker in the school shop or in the home shop.

The Related Instruction Problem

By D. C. Vandercook. Paper, 8⅜ by 11, 32 pages, illustrated. Published by the International Correspondence Schools, Scranton, Pa.

In this book, the author describes an effective apprentice-training program. He outlines the program, defines the instructional problem, shows how supervised correspondence instruction takes care of the individual differences, and how it provides individual progress.

General-Shop Woodworking

By V. C. Fryklund and A. J. LaBerge. Paper, 7¼ by 10¼, 128 pages, illustrated. Price, 72 cents. Published by McKnight and McKnight, Bloomington, Ill.

A group of instruction units explaining the use of the tools and materials of woodworking. The book also contains directions for application of hardware, wood finishes, occupational opportunities for the worker in wood, and suggests a number of projects.

Interesting Art Metal Work

By Joseph J. Lukowitz. Paper, 6 by 9, 64 pages, illustrated. Price, 50 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book contains 22 articles which may be made of various kinds of metal. Some of the projects are composed of units which may be combined in different ways to obtain not only different designs but articles which may be used for different purposes. The methods of performing the different operations are carefully explained both in words and in illustrations. All of the projects shown are exceedingly interesting and embody many metal-working processes, yet the cost of materials required is surprisingly low.

Art in the Integrated Program

By Margaret F. Schaeffer Glace, M.A. Cloth, 6⅛ by 9¼, 93 pages. Published by Cullom and Ghertner Co., Nashville, Tenn.

The author shows how to vitalize art as a school subject by making a fairly thorough analysis of the art content in activity units in grades 4, 5, and 6. Appendix A contains an evaluation chart showing the distribution of the main elements of art in the given activities.

Carpentry

By Gilbert Townsend, S.B. Cloth, 6 by 8½, 436 pages, illustrated. Price, $2. Published by the American Technical Society, Chicago, Ill.

A comprehensive treatment of the subject containing a clear description of the underlying principles of the trade. The part devoted to the practical work of carpentry is divided into framing, walls, floors, girder, stairs, roofs, rafters, timber, trusses, exterior and interior finish, etc.

Diesel and Other Internal-Combustion Engines

By Howard E. Degler, M.E., M.S., Cloth, 5¾ by 8½, 237 pages, illustrated. Price, $2.50. Published by The American Technical Society, Chicago, Illinois.

The impetus which the Diesel and other internal-combustion engines have received within the last few years, makes a book on this important subject an absolute necessity. The present volume is quite comprehensive, well illustrated, and clearly written.

Tin Craft as a Hobby

By Enid Bell. Cloth, 5¾ by 8¼, 111 pages, illustrated. Price, $2. Published by Harper and Brothers, New York City.

A selection of simple projects which may be made of tin.

Upholstered Furniture

By C. W. Seager. Cloth, 6¼ by 9⅛, 181 pages, illustrated. Price, $2. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book is divided into two parts, the first of which contains not only an analysis of the important operations of upholstering, but also clear descriptions of each process arranged in step-by-step sequence. The descriptions are well illustrated. Part II shows the processes and operations applied to a typical piece of furniture. The book is written so that the beginner will understand it.

Association News

MASSACHUSETTS INDUSTRIAL EDUCATION SOCIETY MEETS

The Massachusetts Industrial Education Society held its regular monthly meeting on March 14, in the Hotel Lenox, Boston. About 50 members attended the dinner and meeting which followed. Following a short business meeting, the group listened to a talk by Mr. John W. Higgins, Worcester, Mass., on the subject, "Industrial Education and Industrial Museums." Speaking as one responsible for creating in his industrial plant a finer appreciation of the fine and industrial arts through the museum, Mr. Higgins emphasized the fact that this museum is not a hobby, but an actual part of the factory, and offers a means for the workers to develop a better understanding and appreciation of their job by the study of historical metal products. He commented on the fact that at the present time trade and technical schools fail to meet the demand for skilled labor, and that less than 15,000 young men are graduated periodically to fill 100,000 skilled positions. Mr. Higgins urged that industrial-arts teachers make every effort to educate boys and girls to the necessity of co-ordinating the fine and industrial arts, and pointed out that this is the real function of the public school today. — *A. Irving Dodge.*

MINNESOTA EDUCATION ASSOCIATION CONVENTION

Plans are being rapidly completed for the annual meeting of the Industrial-Arts Section of the Minnesota Education Association, to be held November 6, 1936, in the Vocational School at St. Paul, Minn.

An opportunity will be afforded for all visiting teachers to visit the St. Paul Vocational School, to observe the trades being taught, and to see the various shops in operation. The luncheon meeting is to be held at noon in the Mechanic Arts High School. This will be followed by a program on which there will be one speaker, representing the superintendent of schools, and another representing the industrial-arts field. The business session will be held immediately after the program is completed, in order to give the teachers an opportunity to visit the exhibits and demonstrations to be given at the Vocational School.

— *Stanley J. Pawelek*

WESTCHESTER INDUSTRIAL ARTS CLUB

The March meeting of the Westchester Industrial Arts Club was held in the new Dobbs Ferry High School at Dobbs Ferry, N. Y. The first annual Principals' Night brought out a large number of school executives. Through the meeting it was possible for the principals to learn of the activities of the club and to acquaint themselves with the industrial-arts men of the country.

The program consisted of a display of project sheets, suggestion sheets, related information and safety sheets, new projects, and other new material developed by the club. Motion pictures from the Chevrolet Motor Company were most instructive. The social hour was highlighted by a talk by a guest speaker. — *E. W. Manzer.*

STANFORD UNIVERSITY ANNOUNCES SUMMER CONFERENCE

Stanford University, at Stanford University, Calif., has announced a summer conference on Curriculum and Guidance, to be held during the week of July 6 to 10, on the Stanford Campus. The conference is intended to serve classroom teachers on all levels of the school system, curriculum workers, guidance workers, supervisors, administrators, research workers, and lay people.

The theme of the conference, "Problem of the Curriculum," will be handled in sixteen small forum sessions during the afternoon, in discussion sessions during the morning, and in six general evening sessions. Among the topics to be covered are Guidance in the Modern Educational Program, Proposals for a Unified Educational Program, and Curricula for Special Education.

Among the well-known leaders who will take part in the discussions are Hon. John Studebaker, U. S. Commissioner of Education; Mr. H. L. Caswell, of George Peabody College, Nashville, Tenn.; Mr. Worth McClure, superintendent of schools of Seattle, Wash.; and Mr. C. L. Cushman, director of curriculum and research of Denver, Colo.

INDUSTRIAL-ARTS CONFERENCE AT CALIFORNIA, PENNSYLVANIA

The conference of industrial-arts teachers, held on Saturday, April 18, at the State Teachers' College, California, Pa., attracted more than 400 teachers, principals, and superintendents from Western Pennsylvania. The program for this occasion was prepared by Mr. S. L. Coover and his assistants.

Four well-known speakers addressed the sessions, which were in charge of Mr. W. E. Brunton and Dr. G. D. Whitney. Dr. Paul L. Cressman, of the Pennsylvania State Department of Instruction, the first speaker, discussed "Future Craftsmen of America," giving the main objectives of the organization. Mr. L. H. Dennis, secretary of the American Vocational Association, Washington, D. C., in discussing "Important Changes Within the Next Ten Years," brought out that future school boards will have members who encourage industrial arts and vocational programs. He pointed out that in the future much of our education will be on wheels and that trips and excursions to industries will form a part of the curriculum. Dr. Samuel Fausold, Deputy State Superintendent of Pennsylvania, pointed out that the industrial-arts program is psychologically sound, and that this type of instruction ought to be included in the work of all grades from the first to the twelfth, inclusive. Hon. Joshua Lee, U. S. Congressman from Oklahoma, gave a talk on "Success," in which he urged larger appropriations for educational work. Mr. W. L. Hunter, of Ames, Iowa, who is working on a doctorate at the State College, was introduced.

The next state meeting will be held July 31 to August 1, at State College. — *George C. Donson.*

EPSILON PI TAU INITIATION

On March 28, the Zeta Chapter of the Epsilon Pi Tau Fraternity held an initiation at the Northern Illinois State Teachers College, De Kalb, Ill. At this time, Orville A. Oaks, Woodworking Instructor, New Trier Township High School, Winnetka, Ill., and Clarence B. Allen, Woodworking Instructor, Township High School, Sandwich, Ill., were admitted to membership.

At the banquet which followed, John J. Metz, Editor, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, spoke on "Industrial Arts and the Present Day."

President Gerald E. Considine was toastmaster.

The Theta chapter of Epsilon Pi Tau held its formal spring initiation at Stout Institute, Menomonie, Wis., on Saturday, April 25. Four men from Stout Institute were initiated into the fraternity. Three men from the field, who were also initiated, were Roy R. Van Duzee, West Allis, Wis.; Frank B. Jewson, Superior, Wis., and Fred Stiles, Ames, Iowa.

Following the initiation, the members adjourned for the fellowship banquet. Dean Clyde A. Bowman, as toastmaster, introduced the speakers of the evening. Mr. Frank B. Jewson and Mr. Roy Van Duzee spoke on "What the New Graduate May Expect in the Field," and Mr. Livingston gave some interesting information on "What the Graduating Student May Expect in Graduate Work."

MU SIGMA PI INITIATION

Mu Sigma Pi, Industrial Education Fraternity at Wayne University, held its annual banquet and initiation at the Dearborn Inn on Saturday, March 21, at 6:30 p.m.

President Vincent C. Gourley introduced Dr. Warren E. Bow as toastmaster who called upon Dr. Harold J. Davison to present a symposium including in the list of speakers, Frank R. Kepler and Earl L. Bedell, Faculty Sponsor.

The candidates accepted for membership at the time were Richard M. Carlsen, O. Frank Carpenter, Carl E. Karlstrom, Lyle Ritchie, Gordon Rivers, and Walter Thatcher.

NEBRASKA INDUSTRIAL-ARTS TEACHERS MEET

The second annual meeting of the Nebraska Industrial-Arts Teachers' Association was held March 27 and 28, in the Cornhusker Hotel, in Lincoln. The association has as its objectives, the promotion of a greater interest in industrial-arts work, the setting up of standards of attainment in industrial arts, the development of a new course of study, the inauguration of a program of safety through a knowledge of good practices, the promotion of the development of craftsmanship and leisure-time activities, and the promotion of a closer relationship between the state organization and the national vocational association.

The program comprised five addresses by

well-known teachers, on the topics of automotive mechanics, industrial-arts programs, developments in vocational education, general shop programs, and industrial-arts programs for smaller schools. A discussion followed each talk.

Following the program, a business meeting was held. The same officers were re-elected for another year as follows: President, Mr. A. C. Easton, Lincoln; vice-president, Mr. A. V. Larson, Peru; secretary-treasurer, Mr. L. G. Lindahl, Chadron.

The association adopted a constitution and voted to continue its affiliations with the state teachers' association. A committee was appointed to work out a new course of study in industrial arts for the state, and a second committee was assigned the task of preparing a safety program for industrial arts. Mr. William C. Bicknell, of Kearney, was elected editor of the association in the preparation of news and articles for the state teachers' journal and in furnishing publicity for the association.—*L. G. Lindahl, secretary.*

CONNECTICUT TEACHERS MEET

The spring meeting of the Central Connecticut Industrial-Arts Association was held on April 8, in the high school at Plainville. Approximately forty members attended.

Following a supper at six o'clock, the members made a tour of the shops of the grammar school. The meeting was opened by President Eugene Giammatteo, who turned it over to Mr. H. C. Wiley, chairman of the program committee. Mr. Earl J. MacNaughton, the first speaker, discussed the value of industrial-arts work, arguing that if the teacher takes care of boys which the academic teacher cannot handle, the work has indeed proved its worth. Mr. Everett D. Packard, director of the Hartford Trade School, was the second speaker, stressing the need of an understanding of the objectives of industrial arts. He emphasized that the greatest problem of the trade school is to get the public to see that a certain amount of intelligence is necessary in order to become a tradesman. He mentioned that 30 per cent of the students in the Hartford Trade School are high-school graduates.

President MacAndrews, of the Connecticut Industrial-Arts Association, presented a report on the progress of the state conference to be held in May.

A motion was made and approved that the association center its efforts on the establishment of an industrial-arts department at the State Teachers' College.—*Harry A. Barnicle.*

IOWA INDUSTRIAL-ARTS TEACHERS HOLD MEETING

The annual meeting of the Industrial-Arts Teachers of Southeastern Iowa was held on Saturday, April 4, at Oskaloosa, in connection with the meeting of the Southeast Division of the Iowa Teachers' Association. An interesting program was carried out, under the direction of Mr. T. J. Norwood, of Wapello. Thirty-five teachers of the industrial arts were in attendance.

The meeting opened with a talk on "Keene's Cement Craft," by Mr. E. G. Livingston, of the Iowa State College, who stressed the value of the work and the use of inexpensive equipment. Prof. Charles H. Bailey, of the same institution, gave a demonstration and talk on the subject, "Instructional Aids for Teaching Mechanical Drawing." Mr. E. S. Baird, of the State College, and Mr. Harry W. Carmichael, state supervisor of trade and industrial education, discussed "The Development of Public Safety in the Public Schools," emphasizing safety from the industrial point of view and highway safety.

The next meeting of the association will be held in the spring, at Burlington, Iowa.—*Glenn H. Osborne.*

NATIONAL ASSOCIATION OF ART EDUCATION FORMED

A National Association of Art Education was recently established, with headquarters at 333 East Forty-third St., New York City, N. Y. The Association was formed in response to a demand for a national body which will promote the art education of the nation. Sectional associations are eligible to membership in the Association, while retaining their own identity and organizations.

The plans for the Association call for the appointment of an editorial board to formulate in co-operation with the executive secretary a policy and plan for underwriting and distributing an educational journal related to the field of art education and the activities of the organization. The national body will aid in the development of special groups in art education, and will stand ready to assist sectional organizations financially where needed.

AVA CONVENTION

According to the decision of the executive committee of the American Vocational Association, the 1936 convention will be held at San Antonio, Texas, December 2 to 5.

THE WESTERN ARTS CONVENTION IN NASHVILLE

The combined meeting of the Western Arts and the Southeastern Arts Associations was held April 1 to 4, in Nashville, Tenn. The meetings were well attended and the sessions were the most lively ever experienced in the judgment of those who attended. The industrial-arts sessions attracted a large number of persons, averaging from 100 to 150 persons for each of the three sectional meetings. Superintendents of schools, state directors of education, heads of teacher-training institutions, supervisors, and teachers of art and industrial arts were among those in attendance.

On Wednesday, April 1, Mr. B. N. Hastings, Louisville, Ky., presided. Mr. J. J. Ray, of the Peabody Demonstration School, Nashville, Tenn., speaking on "Co-operative Subjects," emphasized the importance of integration of the industrial-arts subjects with the academic curriculum and with one another. Mr. L. T. Smith, of Western State Teachers' College, Bowling Green, Ky., taking as his subject, "The Teacher and the Activity," pointed out the place of the teacher in an activity program as being a partner in the development rather than one who forces his ideas upon the pupil. Dr. Ullen W. Leavell, of Peabody College, Nashville, Tenn., dwelt upon the psychological approach to education through activity in his talk on "Education and the Activity."

The Thursday morning sectional meeting, which centered around the topic. "Enriching Industrial Arts," was in charge of Mr. L. L. Gore, of Peabody College, Nashville, Tenn. Mr. Frank C. Moore, supervisor of industrial arts, Cleveland, Ohio, in outlining a program for elementary, junior, and senior high schools, stressed the sequence of training in unit shops for the large school systems and the desirability of the general shop for smaller schools. Mr. Carl H. Hamburger, Cleveland, Ohio, speaking on the industrial-arts program in the Cleveland elementary schools, described the craft rooms in the system in which pupils are given an opportunity to work with many kinds of tools and materials, and explained that the work is directly integrated with the elementary-school curriculum subjects. The session was concluded with a talk by Mr. Elmer W. Christy, director of industrial arts, Cincinnati, Ohio, in which he pointed to various ways in which the industrial-arts people may co-operate in making a well-rounded program to include all phases of education.

The Friday morning meeting, which was in charge of Mr. Elmer W. Christy, Cincinnati, took for its theme, "Utilitarian Drawing." Mr. G. H. Hargitt, supervisor of industrial arts, St. Louis, Mo., gave a talk on "Home Planning," in which he explained the layout of the course, taking up the site, financing, materials of construction, designing, and landscaping of homes through graphic representation. Mr. Harry E. Wood, director of practical arts and vocational education, Indianapolis, Ind., gave a practical demonstration of methods of designing industrial-arts projects. Mr. E. A. Hauerstein, supervisor of industrial arts, Lima, Ohio, took up the subject, "General Drawing," in which he presented a series of charts explaining his course in general drawing comprising 22 separate units. Dr. W. E. Warner, professor of industrial education, Ohio State University, Columbus, described a method of approach in selling industrial arts to school boards, taxpayers, and parents.

At the business session, the Association voted to re-elect Mr. Frank C. Moore as president for the year 1937.

The Association voted to hold the next annual meeting in Toledo, Ohio.—*Carl H. Hamburger.*

EASTERN ARTS MEETING IN NEW YORK

The twenty-seventh annual meeting of the Eastern Arts Association was held in the Hotel Pennsylvania, New York City, under the direction of Major Burton A. Adams. The convention ran for four days, April 15–18, and the attendance showed an increase of 600 persons who came to enjoy the program. The visiting members were hospitably received by Miss Margaret L. Murphy and her committee.

More than 1,500 persons were on hand at the opening meeting, presided over by President Walter Klar, Springfield, Mass. Mr. Forest Grant, director of art in New York City, and Supt. Harold G. Campbell of the city schools, ably assisted Mr. Klar. The Abraham and Straus Department Store, New York City, gave a demonstration on "The Importance to Teachers of Good Taste in Dress."

On Thursday morning, Mr. James C. Boudreau, director of the School of Fine and Applied Arts, Pratt Institute, Brooklyn, acted as chairman. Mayor La Guardia greeted the visiting members and gave a talk on "Art." Later the group witnessed the premier of the motion picture, "We Are All Artists," and heard reports of government art projects from James F. Barker, Assistant Superintendent of Schools, Rochester, N. Y. The principal talk, "Art Lights the Earth," was given by Mr.

William McAndrew, who was assisted by his daughter, Mary McAndrew Stonehill. In the afternoon, a group of the members visited the high-school art exhibition and program at the Brooklyn Museum, and the city school exhibit at the American Museum of Natural History. Various groups of children ably demonstrated processes in soap carving, linoleum-block cutting, printing, and thin-sheet-metal tooling.

A feature of the convention was the session of the Junior Eastern Arts Association, with Mr. Vincent A. Roy, of Pratt Institute, acting as chairman. The high spots of the Eastern Arts Association past and present were presented by President Klar and Secretary Ensign. Mrs. Zara B. Kimmey, Director of Art Education for New York State, presented a paper on "Possibilities for Employment in the Public Schools," while Mr. William Wolfe, Director of Art, Madison House and Hecksher Foundation, New York City, demonstrated "How to Employ an Art Teacher." Miss Dorothy C. Oschmann, Art Instructor in Manual Training High School, Brooklyn, described "How Positions are Obtained in New York City"; Evelyn Steiner, Supervisor of Art Education, Long Beach, L. I., New York, discussed "The Purchase and Use of Art Materials"; and Miss Edith L. Nichols, Assistant Director of Art Education, New York City, gave a talk on "Discipline and Other Problems." Mr. C. Valentine Kirby, Chief of the Art Division, Harrisburg, Pa., spoke on "Co-operative Relationships," and Helen Cleaves, Director of Art Education, concluded with a talk on "Comments A to Z." The annual banquet and ship dance on Thursday evening was very successful. Mr. Paul Crabtree acted as ship's captain and toastmaster at the dinner.

On Friday morning, the sessions were resumed, with a talk on "Art in Education," presented by Mrs. Zara Kimmey, Art Supervisor of New York State. She was followed by Miss Louise Nabor, of East Orange, N. J., who gave an illustrated talk on "Art in the Grades," and Miss Charlotte Werner, of Rochester, N. Y., who talked on "Advanced Thought in Art Education."

The Industrial-Arts Session on Friday morning was in charge of Dr. Fred Strickler, of Teachers College, Columbia University. Virgil Nestrick, of Garden City, N. Y., gave a talk on "Utilization of Industrial Arts in the Elementary-School Program," and was followed by Roy G. Fales, of Albany, who discussed "The New York State Industrial-Arts Course of Study." He was followed by Arthur Feuerstein, who took the subject, "The Rogers Junior High School Plan for Industrial Arts at Stamford, Conn." Mr. Earl Page, of Newark, N. J., talked on "Advanced Problems in Industrial Arts," and Mr. W. E. Brunton, Harrisburg, Pa., presented the summary of the discussions and papers.

The Home Economics Section was in charge of Miss Anna G. Green, of Harrisburg, Pa. Dr. Freda Winning, of New York University, talked on "Education of High School Students to Meet Economic Problems of the Home." She was followed by Lyle Boulware, of Pratt Institute, who talked on "Housing in Relation to Satisfying Home Life and Home Living." At the afternoon session, Mr. William L. Longyear, of Pratt Institute, presented the facilities of the Columbia Broadcasting System's School of the Air as part of their series "Treasure Tales of Art" called "Color in a Storied Window." Mr. Herbert Thompson gave "Revelations in the Realm of Color," followed by George Welp, of the International Printing Company, who gave a demonstration and talk on "What Teachers and Students Should Know About Color."

The Graphic Arts Session, on Saturday morning, was in charge of Mr. Henry Holloway, of the New York School of Printing. Mr. Laurence B. Siegfried, of The American Printer, talked on "Printing as an Art and Craft"; Hugh Flaherty, of Floral Park, N. Y., discussed "The Development of Student Leadership Through Graphic Arts Education"; Howard A. Shiebler, of New York City, talked on the subject, "A City School Report Like a Magazine"; and Sol Hess, of Philadelphia, took for his subject, "Choosing the Right Type."

At the general meeting, President Klar spoke on "The Business of Art Education"; Vinal Tibbets, Manhasset, N. Y., discussed "How I Judge an Art Teacher"; and Harry Jacobs, Buffalo, took as his subject, "How an Art Teacher Can be Worth the Cost to the Taxpayers." The summary of the papers and discussions was presented by Margaret Stone and George F. Hatch, of Boston, Mass. At this time the ship's awards were presented by Paul Goward and his assistants.

At the business session, considerable satisfaction was expressed at the phenomenal expansion reported for the last year through the work of the secretary, Mr. Raymond P. Ensign. The Association voted to elect Mr. William L. Longyear as president; Mr. Forest Grant, vice-president; and Mr. Raymond Ensign, secretary-treasurer. Members of the Council include Zara Kimmey, Clayton Smith, and William Millikin.

MICHIGAN INDUSTRIAL EDUCATION SOCIETY CONVENTION

The Ninth Annual Convention of the Michigan Industrial Education Society held at Hotel Hayes, Jackson, Mich., April 23–25, 1936, was an unqualified success. The total registration exceeded 450.

All of the meetings were well attended.

The city directors council met at breakfast Friday, at 7 a.m. Harry A. Burnham was the chairman. Mr. A. C. Tagg, the first speaker, enumerated the qualifications which a city director should have, and some of the things that he should do in conducting the duties. Mr. Earl L. Bedell spoke on "Curriculum Problems," emphasizing the fact that emphasis ought to be placed on curriculum building in the building of courses, and that we must all think about the integration of industrial-arts work with the general work of the schools from the first grade or even the kindergarten upward through the high school. Mr. George H. Fern, assistant superintendent and state director of vocational education, spoke on the re-education of the old teacher, emphasizing especially that the industrial-arts teacher must have job pride, that he can't have too many outside interests, that he must develop in his students correct work habits, safety habits, and the like, and that the teacher must above all keep abreast of industry whether he be a teacher of industrial arts or of vocational subjects.

Dr. George E. Myers, University of Michigan, showed how the university is trying to assist the city supervisors and teachers of industrial-arts work by offering numerous courses for summer school, Saturday-morning conferences, combination conferences, and correspondence courses, and survey services.

Mr. E. C. Russell, Pontiac, Mich., was elected chairman of the city directors council for next year.

At the meeting of the state planning committee for trade and industrial education, Mr. K. G. Smith, presided. Regulations concerning the certification and professional improvement of teachers of trade and industry and general continuation subjects were discussed.

Quite a number of the members took advantage of the trip to the prison at Jackson, where an excellent course in vocational education is given to the inmates. There were four divisional meetings in the afternoon. The first one on vocational and trade training was under the chairmanship of Mr. George B. Frazee. At this meeting, Dr. Verne C. Fryklund, University of Minnesota, spoke on "Outlook for Trade and Industrial Education."

Division 2, "Industrial Arts for the Junior- and Senior-High-School Grades," was under the chairmanship of Mr. Ralph T. Guyer. At this meeting, Mr. Harry E. Wood, Director Industrial Arts, Indianapolis, Ind., gave an excellent talk on design made easier for the industrial-arts teachers, each step of which was illustrated by crayon sketches, emphasizing rhythm, harmony, balance, and variety.

Division 3, "Industrial Education and Part-Time Continuation-School Groups," was under the chairmanship of Mr. A. B. Lightfoot. At this meeting, Mr. Earl L. Bedell spoke on "Junior Craftsmen of America," Mr. Harry A. Burnham on "Preparation for Employment in the Flint Factories," and Miss Georgia Lightfoot on "A Study of the Adjustment of a Group of Mentally Retarded Children."

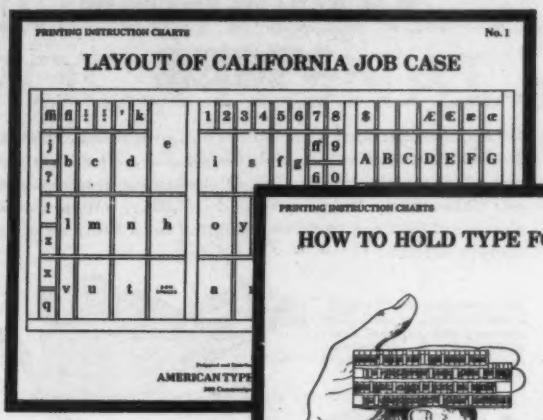
Mr. I. H. Turnbull was the chairman of Division 4 in which industrial arts for consolidated and village schools was discussed. Speakers on this program were Professor Duane Chamberlain who spoke on the "General Shop in Consolidated and Village Schools," Mr. Chalmers Youngs, who spoke on "Projects I Have Found Useful," Mr. Harold Nelson, who spoke on "Obtaining Equipment and Materials for a General Shop," and Mr. Donald Staebler, who spoke on "Teaching Devices Which Really Help."

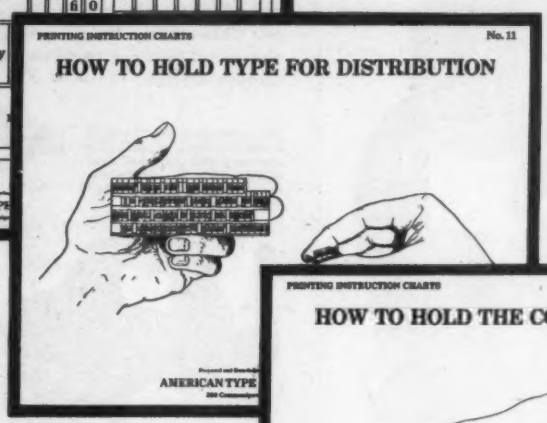
At the annual dinner and dance, Friday evening at 7 p.m., presided over by President Deyo B. Fox, Dr. Robert G. Foster spoke on "A New Field in Educational Guidance."

Saturday morning was devoted to round-table conferences on aeronautics and auto mechanics, related trade work, electrical, drawing, machine shop and forging, general shop and woodwork, general continuation, printing, room layout and equipment, and safety. At 7 a.m. the Mu Sigma Pi Honorary Fraternity of Wayne University, Detroit, had a breakfast meeting at which the work of Wayne University was thoroughly explained. At the luncheon meeting Saturday noon, Dr. Verne C. Fryklund, University of Minnesota, chose for his topic "From Concepts to Techniques." At this time, too, President Deyo B. Fox gave a report of last year's activities.

At the business meeting, Mr. Luther E. Hail, Detroit, was elected president for the coming year, and Mr. Elmer C. Weaver, Kalamazoo, vice-president.

The finale of the convention was the Ship's program in which Mr. John Claude, as captain, distributed the prizes contributed by the 34 firms that had exhibited.





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7. Characters Difficult to Distinguish
8. How to Read Composed Type
9. Standard Proof Marks
10. How to Empty a Stickful of Type
11. How to Hold Type for Distribution
12. Lining Type with a Rule
13. Styles and Faces of Type
14. Different Kinds of Indention
15. How to Piece Out Short Leads
16. How to Set a Stick for Short Measures
17. Proper Way to Place Type in the Stick
18. Picking Up a Line to Replace in the Stick for Correction
19. How to Tie Up a Page of Type
20. How to Fasten the Page Cord
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Many schools prefer to reproduce these charts for instruction sheets and for use in pupil's notebooks. To meet this request we have prepared a set of electros reduced to size shown above. Price of electros covering subjects Nos. 1 to 18 inclusive, $2.00 each. Price of halftones covering subjects 19 to 23 inclusive, $3.00 each.

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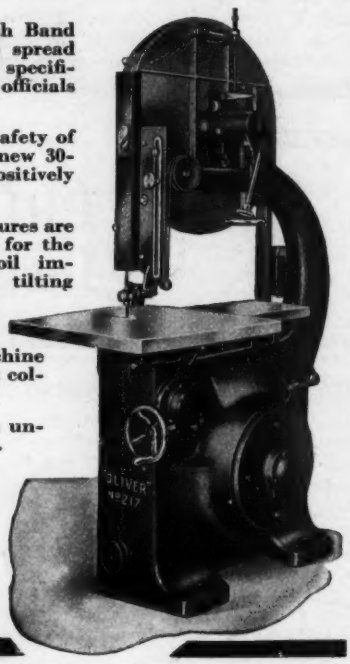

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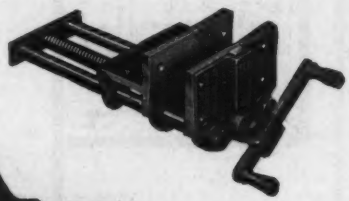

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School-Shop Equipment News

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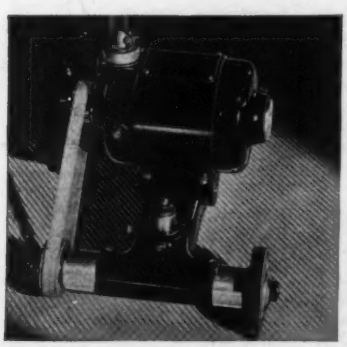

range of work, helps to get more done in a day, performs accurate work, is the lowest-priced grinder, and brings the time and labor savings within the reach of every shop and toolroom. It is equipped with the new type bearing mounting, with the housing a part of the grinder frame, which eliminates the expense of interchangeable spindles.

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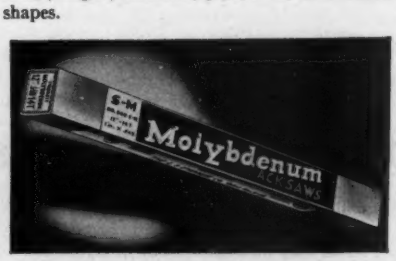
NEW STARRETT S-M MOLYBDENUM HACK SAW

The L. S. Starrett Company, Athol, Mass., has announced the addition of a new S-M Molybdenum hack saw to its line of Starrett tools. This hacksaw is intended for use in rapid, economical cutting of nickel, monel metal, stainless steel, phosphor bronze, and hard alloys, and is useful also for cutting solids, angles, channels, pipe, rails, and similar shapes.



The new Starrett Molybdenum saws come in a variety of lengths and sizes for hand frames and power machines. A copy of the new Starrett bulletin describing the saws will be sent to any shop instructor upon request.

ISSUE HOME WORKSHOP HANDBOOK

The South Bend Lathe Works, South Bend, Ind., has issued a new handbook entitled, *The Home Workshop*, which will be of interest to homeshop workers.

The booklet offers examples of fine machine work, with illustrations of twenty or more different operations, and the setup required for each. A number of unusual applications are included in molded plastics, in the making of ornamental and practical objects of cast or wrought iron, and adaptations to homeshop objects of rare alloys, including duralumin, monel metal, etc. The broad scope of the illustrations gives an indication of what the average shop is like, and what tools are required for each operation. A section of the booklet is given over to handy references for the home craftsmen and mechanic, including tables of decimal equivalents in inches, Metric-English equivalents, standard sheet-metal and wire gauges, and tables of standard screw-thread pitches and tap-drill sizes, instructions for finding diameters and speeds of pulleys, and information on the hardening and tempering of steel. There is a directory listing manufacturers of supplies, project plans, and equipment for the workshop, which will be found useful by makers of model airplanes, model railroads, model boats, gasoline and steam engines, and amateur telescope supplies.

A free copy of the booklet will be sent to any school official, or instructor, who requests it.